

# IFF

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**Fire Apparatus Equipment**



**Water Supply**



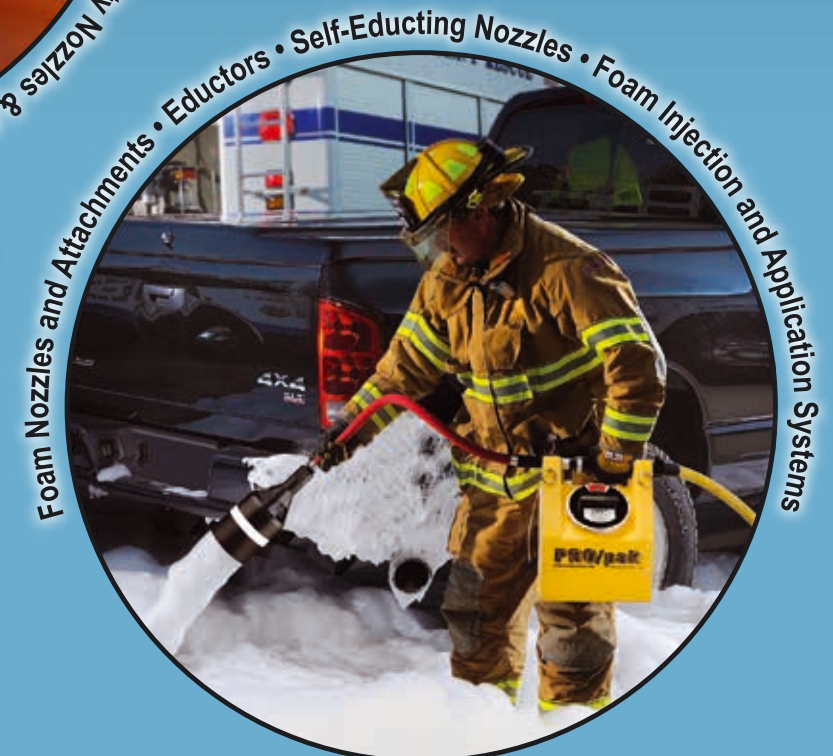
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# YONE PROEYE 751-SNR

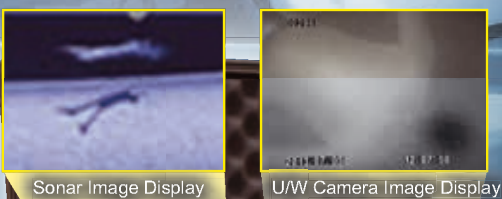
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**Search out by SONAR and pinpoint with the Underwater Camera Head! Great result in dark and cloudy waters!**

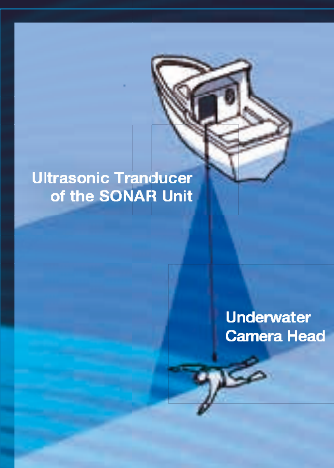
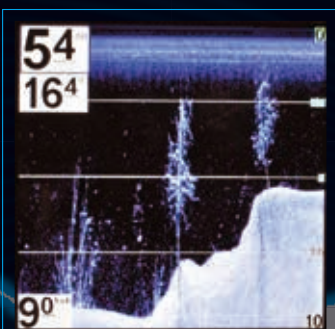
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The system is designed compactly for optional use for various types of search & rescue operations.

GPS System indicates exact location on the display.



SONER Display image



## MARCH 2016 • ISSUE 49

Cover image: When the safe deployment and use of a high volume masterstream appliance is required, portable monitors such as the Crossfire shown, incorporate an integrated safety shutoff mechanism to avoid unintentional and unwanted movement during operation. Image courtesy of Task Force Tips.

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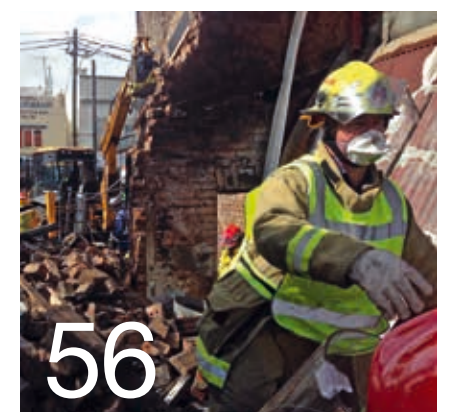
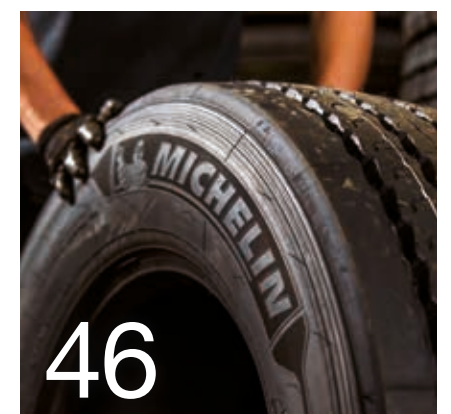
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## Critical Operations Raises Global Profile



**Lt. Colonel Expert Ali Hassan  
Almutawa FIFireE**

**Director of Operations Department  
– Dubai Civil Defence**

**H**aving been recruited in 1998 as a Corporal Watch Commander deployed at Al Qusais fire station, a key station in the developing Dubai, my role was multi-functional and included writing new training and development policies for operational crews, together with setting fire safety inspection regimes and controls for the Risk profile around Dubai. Operationally I was involved in many major incidents often being tested at an early stage as to my suitability for progression through the ranks as a potential strategic officer.

In 1999 I was selected for an international fire officer training program in Toronto, Canada where I successfully gained my first degree in 'Fire Science' and a diploma degree in 'Fires in Airports and Seaports'.

In 2000 I was appointed as a District Officer taking charge of many incidents as the initial incident commander, whilst still continuing with my studies, my appetite was there for an intense career in Civil Defence and the protection of life and property. In 2002 I was appointed as a Station Director focusing on policy writing for operations, communications and training.

As the new operations control room was being developed and expanded in 2005, in order to keep pace with the rapidly developing Dubai, I was deployed

as the Senior Group Officer responsible for staffing, training and equipping the control suite.

After graduating with a bachelor degree in 'Law' from Dubai Police Academy in 2007 and attaining another diploma for 'Operations Room Management' from Germany in 2014, I was further promoted to the rank of Senior Director of Operations, in charge of the department.

Dubai's dynamic profile is evolving at incredible pace with the risk footprint constantly changing. We live in a very exciting vibrant country and our unique city is full of expression and ambition – a densely populated, multi-cultural environment embedded with a sentiment of satisfaction and safety.

Such growth and a constantly changing skyline, the Civil Defence mission is to keep pace with the uniquely challenging structures and designs whilst ensuring the skill development and technical requirement provides a benchmarked, yet smart resilience, whilst uniquely striving to be one of the safest cities in the World.

Those that have visited Dubai will understand the label of 'smart city' and we at Civil Defence are continually seeking for 'smart solutions' with an endeavor to remain at the leading edge of technology and skill development so we can protect our environment. From firstly advising architects and designers with fire engineered solutions and agreeing on a core 'brand protection' philosophy, through an integrated building management system for early detection and alerting to a dedicated set of operating procedures that sets out best practice tactics and tested interoperability with all emergency agencies and stakeholders.

We have been extremely busy with awareness and educational campaigns targeting sectors that required some additional efforts, with a concentration of closely monitored interactive drills and exercises giving direct advice to the recipients whilst at the same time testing our response and command structures. These measures are now showing

positive results not just from a learning platform but operationally now we have been tested and we are delighted to see direct successes. This doesn't mean the job is done, in fact far from it, we will continue to improve and to strive for higher excellence through further learning, research and development.

Having recently been decorated for actions in several incidents as Incident Commander and receiving an award for achievements as a dedicated Civil Defence Officer, who has made a positive impact in the Organisation by always welcoming and sharing knowledge through best practices with International partners and Organizations. This included promoting the joint cooperation and policy sharing between Dubai Civil Defence and key international fire and rescue authorities aimed at sharing knowledge. I have also been extremely supportive towards the establishment of the UAE GCC IFE branch, and am enthusiastic in developing the local branch activities not only within the Dubai Civil Defence but across the Emirates in all sectors.

Based at the Dubai Civil Defence Headquarters, I will always extend a friendly welcome for any visitor who has a wish to share experiences, whilst modestly showing the successes of the Dubai Civil Defence Fire and Rescue Departments with of course my fellow Commanders and Officers keen to meet and discuss with any Civil Defence or Fire and Rescue colleagues.





# News

## Serco trains UN firefighters based in Afghanistan

Serco's International Fire Training Centre (IFTC) in Teesside, UK one of the world's leading aviation fire training centres, has recently trained a delegation from the United Nations (UN) fire safety leadership team based in Afghanistan.

The senior UN fire officers underwent two weeks of intensive aviation fire training at the Centre, which is based at Durham Tees Valley Airport, near Darlington in December 2015.

The UN fire safety team in Afghanistan provides firefighting cover to regional and provincial air terminals, air fields and Helicopter Landing Sites across the country. The diverse team is made up of fire officers from various UN member states including the USA, Philippines, Uzbekistan and France.

ITFC's experts provided the group with a mixture of theoretical and hands-on training, which covered crash rescue

and incident command for both fixed and rotary winged aircraft.

The UN team described the facilities as "excellent", praised Serco staff - in particular their lead trainer, Walter Moore who "epitomises professionalism" - and plan to send more firefighters to the Centre for training in future.

Alonzo Baldwin, one of the UN fire officers on the course, commented: "The way IFTC can combine theoretical training with a full blown exercise makes it a truly world-class facility in firefighting."

Serco's Gary Watson, Business Operations Manager for the IFTC, said: "Teesside is a far cry from Afghanistan, but our unique facilities enable us to train firefighters from around the globe for all eventualities. It was a real privilege to support the UN team who operate in a life protecting role in one of the world's hot spots. We are delighted that they found the course of such great value."

IFTC currently trains around 10,000 delegates from around the world each year. Its experts are firefighting professionals with extensive hands-on experience across military, industrial and civilian ranks.



For more information, go to  
[www.serco.com](http://www.serco.com)



Image courtesy of Serco

## Pierce Manufacturing at FDIC Exhibition

Pierce Manufacturing, the leading North American manufacturer of fire and emergency vehicles, will display a total of 18 fire and emergency apparatus – and demonstrate new technologies – during the Fire Department Instructors Conference (FDIC) Exhibition in Indianapolis from April 21st – 23rd 2016.

Pierce maintains its central hub location at the entrance of Lucas Oil Stadium (LOS) where, this year, it will feature 11 vehicles, including a wide range of pumper, aerial,

and rescue apparatus. A second Pierce booth, showcasing five apparatus, will be located at stand #5521 in the Indianapolis Convention Center. Two additional apparatus will be on display outdoors.

The company will hold an event at LOS on Thursday, April 21st at 1:00 pm to introduce the vehicles and exciting new technologies on hand.



For more information, go to  
[www.piercemfg.com](http://www.piercemfg.com)



Image courtesy of Pierce Manufacturing

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## POK – Celebrating 40th anniversary at FDIC International

POK SAS is the leading firefighting equipment manufacturer in France. POK is known worldwide for its wide range of hand nozzles, manual and remote controlled monitors, foam equipment, trailers and hose reels – in total overall 4,000 products which are all manufactured in France.

POK products are designed to meet the needs of fire brigades and the company also manufactures a wide range of equipment for fire trucks. POK supplies local authorities, chemical, oil and gas and high explosive risk sites, as well as airports, buildings, road transport markets and last but not least Army, Navy and Air Forces around the world. For example, storehouses, petroleum refineries, and fuel containers need high expansion foam generators and very powerful monitors, which POK develops for fixed installations as well as portable or trailer mounted.

POK supplies specific hose reels such as: pneumatic mobile hose reels for tunnels, earthquakes-resistant hose reels for nuclear power stations, and customised hose reels for the Navy. The company equips waste incineration plants with remote controlled monitors, and water supply and sanitation services with valves and strainers. POK manufactures different types of fittings for customers in more than 90 countries.



What makes POK different is their commitment for high quality and robust equipment. POK is a DQS UL listed company and has 40 years experience in the safety field, working closely with fire brigades all around the world. POK designs and produces equipment with the end user in mind and all products are compliant to the necessary standards. POK understands the high-level demands of firefighting brigades and takes them into account – they have also developed specific equipment adapted for salty and corrosive environments. The company serves their customers well by knowing both their needs and demands. POK designs products that can be easily maintained or repaired in the customers own workshop instead of having to ship them back to the factory. You can save both time and money! Alternatively, POK can provide the customer with service and maintenance in POK's facility. The after sales service team is happy to teach you how to undertake your own maintenance and provide you with the necessary maintenance kit.

POK has a research and development office to design and manufacture products according to customer's needs as the company is keen to solve your problems and help you. Sometimes, small changes can be easily made in the company's workshop at no extra costs – please do not hesitate to ask if they can "easily do it".

Finally, during the Firefighting Combat Challenges, you may have noticed the POK nozzles in use. During the challenges, the nozzles are regularly thrown to the ground every 3 minutes or so. POK's nozzles are the only ones to be used throughout the challenge without having to repair or change the nozzle. The reason why POK nozzles are so widely used in the USA and elsewhere is because they show an exceptional shock resistance and are made to last.

POK are looking for distributors in the USA. Please visit them on booth 5649 at FDIC, Indianapolis where they will be pleased to show you their best sellers like the latest Montmirail self-oscillating monitor. To book an appointment please contact pascal.cambournac@pok.fr

For more information, go to [www.pok.fr/en](http://www.pok.fr/en)

## Avon Protection acquires Argus

Argus thermal imaging cameras were acquired by Avon Protection in 2015 to broaden Avon's range of products on offer to the fire and first responder markets worldwide. As a world leader in CBRN PPE and respiratory protection, Avon Protection provides complete solutions for air, land and sea based personnel in military, law enforcement, first responder, fire-fighting and industrial sectors worldwide.

Argus thermal imagers are a well-established and innovative leader in the hand-held thermal imaging market and are an excellent addition to the Avon Protection product portfolio. The intelligent design, excellent image quality, and breadth of products allows us to continue to offer the best quality products to customers.

### The new Argus Mi-TIC S thermal imager now live

Avon is now manufacturing and shipping the new Mi-TIC S thermal camera to fire fighters around the world.

With the most features as standard, the Mi-TIC S is the lightest, safest camera around with Dynamic Scene Enhancement (DSE)™. The Mi-TIC S ensures firefighters don't need to compromise when it comes to safety.

Simple and rapid one hand operation and the clear, easy-to-use interface allows full understanding of a fire scene and better-informed decision making.

Available as standard with a 2 year warranty and options to extend, the Mi-TIC S gives the lowest cost of ownership on the market, and is the sure-fire thermal imager for firefighters around the world.



### Avon's Deltair® – the most innovative SCBA available, designed by firefighters for firefighters

Avon's successful Deltair SCBA has been developed to meet and exceed the standards for Open-Circuit Self Contained Breathing Apparatus for Emergency Services.

Developed to deliver the same ruggedness and reliability that we put into all our respiratory products, Deltair has been tested to a variety of NFPA, NIOSH, and Mil Spec standards to ensure it meets and exceeds the tough demands required by the fire service.

For more information, go to [www.avon-protection.com](http://www.avon-protection.com)

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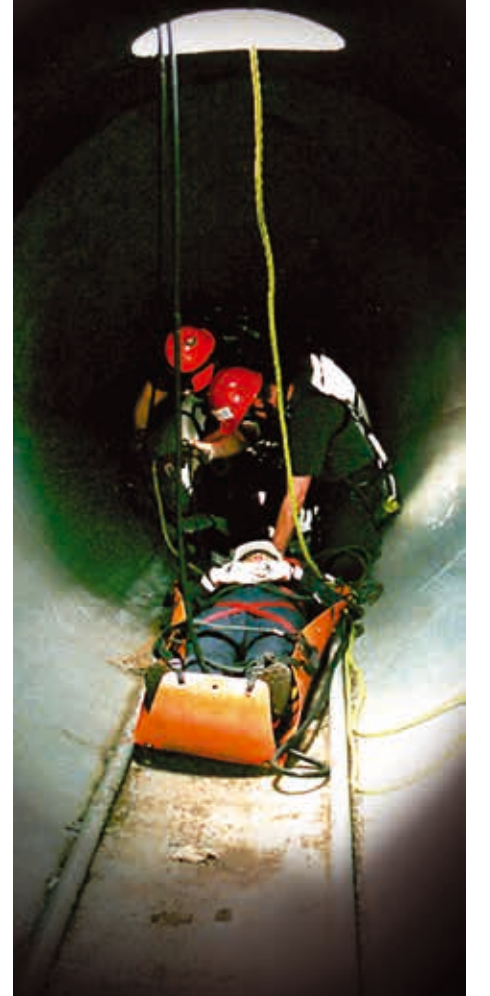
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[www.gulffire.com](http://www.gulffire.com)



## APF ASIA PACIFIC FIRE MAGAZINE

APF Magazine is the only quarterly journal for the Asia Pacific fire market dedicated to both fire protection and firefighting. Written by leading fire prevention and fire fighting professionals, every issue is packed with in-depth technical features and the most recent developments in testing, codes and standards. Regular product and company profiles, events updates and news make APF the first choice read for fire, rescue and safety professionals.

[www.apfmag.com](http://www.apfmag.com)

## IFP INTERNATIONAL FIRE PROTECTION MAGAZINE

IFP Magazine is the only international journal dedicated to fire safety, prevention and protection covering every aspect of the passive and active fire protection market. The editorial features are written by industry experts and comprise a unique blend focusing on the latest technology and equipment as well as highlighting sector specific issues from around the world. Regular product and company profiles, events updates and news make IFP the first choice read for fire safety professionals.

[www.ifpmag.com](http://www.ifpmag.com)



## News Panthers spotted on the Faroe Islands

RK Brand & Teknik A/S in Denmark has delivered a pair of compact Rosenbauer Panther "S" airport crash tenders to Vaga Floghavn Airport on the Faroe Islands.

RK Brand & Teknik A/S worked closely with the customer and Rosenbauer International AG to deliver these stunning airport fire tenders built exactly to the customers' requirements. Vaga Airport were actively involved throughout the planning and manufacturing process of the trucks, which in-addition to staged visits to the factory also included a two week training and familiarisation package at H.C Anderson Airport in Odense plus a full day at the DEKRA proofing ground facility – prior to their delivery to the Faroe Islands.

The identical Panthers are built on a 2.5 metre wide Rosenbauer Motors 6x6 chassis specified with a Volvo D6 700 hp Euro 5 diesel engine and Twin Disc automatic transmission. The crew safety cabin accommodates a driver and 3 crew and is fitted with HO Bostrom seats with SCBA mountings for the driver plus one crew member.

The tender carries 9,100 litres of water, 1,200 litres of foam plus 200 kg of DCP. The Panther makes use of the Rosenbauer Logic Control System (LCS) and were specified with a Rosenbauer RM60E remote roof mounted monitor delivering 6,000 LPM, a Rosenbauer RM15C bumper turret delivering 1,500 lpm, a Rosenbauer



R600 low pressure pump rated at 6,000 lpm plus two rapid response hose reels.

These new Rosenbauer Panthers will replace 2 x Volvo airport crash tenders dating from 1995 and 1997 which will be re-deployed to H.C Andersen Airport.

For more information, go to [www.brandogteknik.dk](http://www.brandogteknik.dk)

## IAFPA – Asia

International Aviation Fire Protection Association (IAFPA) has recently set up a regional headquarters in Singapore to better serve the Asia Pacific region. The regional centre aims to help to promote International Civil Aviation Standards in Aircraft Fire Fighting and Rescue and to promote closer co-operation between the various Emergency Responders by interactive programmes which will be held at locations across Asia Pacific and the Middle East.

IAFPA Asia will be helmed by Cletus Packiam, Fire Chief at Airport Emergency Services (AES) at Changi Airport Group (CAG).

Membership is open to individuals as well as corporates. A joining fee of S\$20.00 in addition to an annual subscription of S\$100.00 for individuals and from S\$3,000.00 for corporate members will be applied.

For more information, go to [admin@IAFPA.asia](mailto:admin@IAFPA.asia)



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## Ziegler Z6 for Sofia Airport

The Sofia Airport in Bulgaria recently received a Ziegler Z6 with Z-Attack Turret. The vehicles specification is FLF 80/120-14 Z-Attack.

### Ziegler Z6 for the Airport Sofia in Bulgaria

This special Z6 is built on a Type ZT3670 6x6 Thomas Chassis and powered by a 700 HP Volvo R-6-cylinder diesel engine with common rail injection, turbocharger and intercooler. The vehicle is equipped with a Ziegler FPN 10-8000-1ML centrifugal fire pump and a foam system with Electronic Automatic Dosage Unit.

The pump system is powered by the vehicle engine using a connectable TWIN-DISC Power Divider. The firefighting capabilities include 12,000 litres of water and 1,400 litres of foam. The front turret delivers 1,600 litres per minute (lpm).

In addition a training simulator was specially developed to the customers' specifications for training firefighters how to master extinguishing techniques of the Z-Attack.

This is the first ZIEGLER Z-Class vehicle which has been delivered with the Z-Attack High Reach Extendable Turret (HRET). The Z-Attack was designed in-house by Ziegler and will be produced at the factory in Giengen, Germany.

For more information, go to [www.ziegler.de](http://www.ziegler.de)



### ZIEGLER Z-Attack HRET

The technical data and advantages of the Z-Attack;

- Maximum range of 17/20 meters
- Outreach of 12/14 meters
- Delivery rate up to 6,000 lpm, extended 4,000 lpm
- Additional extinguishing agents
- Optimal backlash-free positioning of erecting cylinder
- Accurate position indicator on the display for the operator through cylinder integrated position indicator
- Driving with extended Z-Attack possible up to 15 km/h
- Rapid square-off of the desired attacking position (ca. 6 sec)

## Last Voices by Martin Sugarman

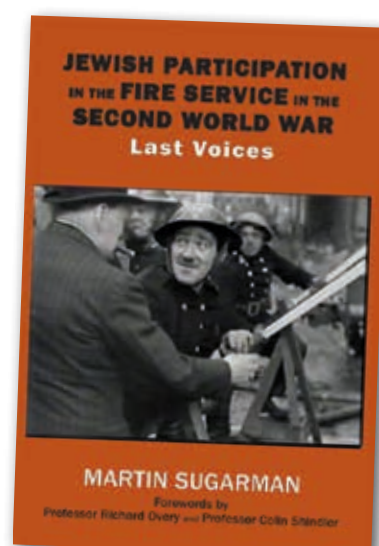
Here for the first time author Martin Sugarman documents the essential part played by Jewish personnel in the Fire Service in the Second World War. Ever civic minded, Jews from all social backgrounds were pre-war volunteers to be trained for dealing with the expected mass bombing of cities by the Germans. After war was declared, by 1940-1 many younger Jewish men and women volunteered or were called up to the armed services, whilst many who were too old or unfit for the military stayed on with the Fire Service.

This considerable number of Jewish firemen and women played a major role in the civil defence of Britain. Some won

bravery awards, including the only George Cross – the highest civilian award for courage – won by a London Fireman during the war. Many gave their lives; this is their story.

The author has captured part of this extraordinary contribution of daring, effort and suffering through the use of archival material, books and personal 'Last Voice' interviews, while numerous, never-before-published, photographs illustrate and illuminate the text.

The book contains 500 pages, 280 photographs and as a special offer readers of IFF can purchase the book for £30 / \$65 (normal retail price £35.00/\$74.95). To order please email [info@vmbooks.com](mailto:info@vmbooks.com) and quote IFF2016 for a proforma invoice. Offer valid until April 29th 2016.



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# MetalCraft Marine

## Congratulations to FDNY on the completion of their new FireStorm 70

FDNY has had a long history of serving the needs of their community dating back to 1648. It wasn't until 1865 that the modern-day Fire Department was first established. The professional force was needed to better provide protection to the fast-growing and increasingly complex metropolis. The first reference to the nomenclature F-D-N-Y was made in 1870.

This particular version of MCM's 70 footer is scaled down slightly to fit the needs of FDNY. Our traditional FireStorm 70 is four feet wider, slightly longer and has a much larger cabin/tool room. MetalCraft Marine Incorporated is a fully integrated designer and manufacturer of custom high performance fire, rescue, patrol, research and other specialized work boats. MCM was established in 1987 and is a World leader in aluminum high speed, high pumping craft. With over 630 hulls built to date, in

▼ The newest member of New York's Bravest will be christened *William M. Feehan*.

service vessels include Boston, Port of Houston, Washington DC and Miami Fire Departments along with US Coast Guard, US Navy, Panama Canal Authority and many other Ports around the Globe.

"The name of the new boat 'William M. Feehan' holds special meaning to FDNY. First Deputy Commissioner Feehan was killed on that fateful morning terrorists flew hijacked jetliners into the twin towers on Sept. 11, 2001. At 71, he was the oldest of the 343 FDNY members who perished.

Feehan was a blaze-battling legend in his own time, heralded for his intuitive knowledge and cunning in fighting fires. He was thought to have known the location of every fire hydrant in the Big Apple and remains the only FDNY member to have held every rank in the department, from probationary firefighter on up to fire commissioner. The name plate held high on along-side the cabin of their new fireboat is milled from an I-beam lifted from the rubble and ruin of the World Trade Center over 14 years ago.

"He was a fireman's fireman," Salvatore

Pastore said over the phone from Brooklyn. Pastore is a lieutenant with Marine Company 6 as well as FDNY liaison with MCM for the new boat.

"We'll never forget any of the firefighters we lost that day," noted 28-year veteran Pastore. "But this lets 'Chief' Feehan's family know that we're remembering him in a special way."

"Working with the FDNY team on the build of the William M. Feehan has been a tremendous honor for us at MetalCraft. With the input of the FDNY personnel, we have implemented several new features on this fireboat. The FS70 is our flagship vessel, and the William M. Freehan is undoubtedly our most advanced one to date," commented Michael Allen, MetalCraft's General Manager. "We hope the FDNY and people they protect will benefit from this vessel for many years to come."

MetalCraft's Project Manager Jay Milner said "It has been a great pleasure working with the FDNY organization, their knowledge of both the Marine and Firefighting aspects combined, has made this vessel a one-of-a-kind machine. I have thoroughly enjoyed every step of the process and have learned from them during the course of the build. Wishing them all the best and stay safe."

The William M. Freehan sailed from MCM via Lake Ontario to the Erie barge Canal, down the Hudson and out at NYC. The journey took 4 days and had a huge welcome upon entering the New York harbor on October 12, 2015.

FDNY Marine Companies are the New York Fire Department's fireboats and are tasked with SCUBA/Dive Rescue and off-land firefighting in New York's rivers and harbors. The FDNY's three Marine Companies operate large fireboats and smaller, secondary rescue boats to respond to various marine-related emergencies.



For more information, go to  
[www.metalcraftmarine.com](http://www.metalcraftmarine.com)

# MetalCraft Marine

## INCORPORATED

MCM is the industry leader in designing and building custom aluminum high-speed fire and rescue boats. The FireStorm has a rich history of delivering quality harbor security and first response vessels to many major ports and harbors.



Top: FireStorm 40, Melbourne Fire Brigade, Australia.

Above: FireStorm 50, Kuwait City Fire Services, Kuwait.

Below: FireStorm 50, Rio de Janeiro Fire Department, Brazil.

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# Frontline Fire & Rescue Equipment

## Australia's leading manufacturers of firefighting and specialist Vehicles

Rio Tinto Iron Ore (RTIO) operate numerous mine sites around the thinly populated Pilbara region of Western Australia. These remote mine sites are operated as Fly In/Fly out (FIFO) operations which is a method associated with flying personnel to remote mining operations in Australia for a short period of time instead of permanently relocating the employee and their families. Rio Tinto operate specific key airports to transport personnel to work on this basis.

The largest of these Fly in/Fly out sites is Boolgeeda Airport (YBGD) which has existed albeit originally with a dirt runway – since the 1950's. In recent years the airport and its facilities have been significantly upgraded with a range of closed charter aircraft including Fokker 100, Boeing 737 and Airbus A320 now flying FIFO personnel direct to the airport from Albany, Perth, Busselton and Geraldton airports on a daily basis

▼ Originally a dirt runway Boolgeeda Airport has been significantly upgraded to accommodate modern aircraft.



Image courtesy of Wikimedia

As a private airport operator Rio Tinto are under no obligation to meet International Civil Aviation Organisation (ICAO) regulations. However the company are committed to providing a sustainable duty of care to their employees and therefore provide an appropriate level of fire and crash-rescue cover to oversee aircraft movements at their airport operations. Currently the company is upgrading this level of cover with a project incorporating the refurbishment and re-purposing of some existing vehicles as well as the sourcing of a large ARFF vehicle and three stored pressure CAFS fast response vehicles. In 2014 the company started discussions with Perth based Frontline Fire Rescue Equipment to supply a new airport rescue and fire-fighting vehicle for its Boolgeeda Airport operation as well as the supply of the CAFS fast response vehicles and the refurbishment project.

Frontline Fire & Rescue Equipment established in 2007 are one of Australia's leading manufacturers of fire-fighting and specialist vehicles. From their new state of the art headquarters located in the Malaga district of Perth the company use the latest

design technology and manufacturing processes to produce quality, innovative and practical fire appliances finished to the customers exact requirements. The company manufacture vehicles under contract for the Western Australia State Government and custom built vehicles for multi-national mining and oil/gas clients. They offer servicing and maintenance support for existing fire-fighting vehicle fleets and they are currently in the early stages of a 3 year multi-million dollar (A\$) contract for the upgrade of 700 fire engines with enhanced crew protection measures including water deluge systems.

Frontline Fire & Rescue Equipment have recently delivered this stunning clean-flowing one-off custom built ARFF vehicle to Rio Tinto Iron Ore for its Boolgeeda Airport operation – the Australian built fire truck considered to be a serious rival to equivalent commercial based ARFF vehicles manufactured by leading international fire-engine manufacturers. Working closely with the customer the company have designed this stunning highly specified aerodrome fire-fighting and crash rescue vehicle from the ground up using the latest computer aided 3-D technology and the expertise of their technical, drafting and engineering teams. RTIO have acknowledged the importance of the local content of this project and the after sales, support and maintenance that can only be provided by a local supplier.

This airport crash tender is based on a special-build Scania P360CB 6x6 HHZ chassis fitted with a 265 kw Euro 5 diesel engine, 12 speed automated manual transmission, an engageable transfer case plus ABS braking. It features a Scania "Day" cab seating a driver and 1 crew with integrated SCBA seating and a modular aluminium body incorporating 4 large lockers enclosed by Centurion roller shutter doors. The rear pump module houses a Waterous CXVT pump delivering 3,800 lpm @ 10 bar which is powered by its own independent Cummins water-



Images courtesy of Matt Hayes



**FRONTLINE FIRE  
& RESCUE EQUIPMENT**

cooled diesel engine. The pump module also houses 2 x electric rewind hose reels complete with 60 metre x 25 mm booster hoses and Akron Pistol Grip nozzles; the comprehensive pump control panel, the on-board foam-fill system, various deliveries and the suction inlet.

The central tank module consists of a single alloy tank holding 8,000 litres of water, plus 1,000 litres of class "B" Solberg RF6 foam concentrate (linked to a FoamPro Auto-Foam foam proportioning system) and 200 litres of Solberg Fire-Brake concentrate (linked to a FoamPro Turbo-Foam foam proportioning system). The front module houses a skid mounted Perren Engineering 125 kg DCP system c/w hose reel and nozzle to the off-side – plus various stowed fire-fighting and crash-rescue apparatus. The tender makes use of an Akron Trident remote roof mounted monitor c/w manual in-cabin override combined with an Akron Electric foam nozzle delivering 3,000 lpm – plus an Akron Firefox remote bumper turret fitted with an Akron Electric Jet/Fog Master Stream nozzle – delivering 500 lpm. It also has under body foam sprays, a windscreen

▲ A stunning image highlighting the clean lines of the innovative Scania P360 CB6x6 HHZ airport crash tender supplied to Boolgeeda Airport in Western Australia.

► The rear pump module; showing the Waterous CXVT pump, pump control panel, deliveries and suction inlet plus external tank warning lights.



water spray system and is fitted with Hazard LED lighting to the front, sides, rear and roof of the fire truck.

This innovative crash tender was manufactured to a very high standard meeting all current ICAO and NFPA standards.

As the vehicle is to be operated by their existing Emergency Services staff, it was a requirement that the vehicle could

be deployed and operated by only one person. Whilst its main purpose is to provide fire-cover to the aerodrome, the vehicle has been designed to complement the existing fleet of Mines Emergency Response Vehicles, at other incidents that may occur on the rural site.

For more information, go to [www.ffre.com.au](http://www.ffre.com.au)



# Scott Safety

## A game changer in decontamination is achieving a fire industry first

A new portable airborne and surface decontamination solution from Scott Safety is achieving a fire industry first – decontamination of chemical, biological and radiological vapours, liquids and particles simultaneously in as little as five minutes.

The Light Decontamination System – LDS can decontaminate environments as large as 500m³. At only 22 kg, LDS is the lightest portable decontamination system in its class, enabling first responders to work effectively in both confined and remote environments.

“LDS will revolutionise the fire market” says Dr David Crouch, Global Product Manager for Military & Civil Defence at Scott Safety. “It’s lightweight, portable yet extremely powerful. In validation trials, the system decontaminated anthrax by 99.999999 percent from a 100m³ space, in less than five minutes.”

When exposed to CBRN (the release of chemical, biological, radiological or

▼ The Light Decontamination System (LDS) from Scott Safety can decontaminate environments as large as 500m³.

nuclear materials), prompt decontamination of fire fighters and their equipment following hazardous materials incidents, is paramount. Exposure can happen in a multitude of situations, from a call out to investigate accidental releases of hazardous materials at industrial locations, to flood defence, motorway fuel spillages and even terrorist activity. As the industry also learns more about the long-term effects of firefighter exposure to carcinogens and the link to occupational cancer, decontamination at the incident scene is more important than ever.

With the rising cost of Personal Protective Equipment (PPE), providing back-up gear for every firefighter in a brigade is a significant investment. LDS provides brigades with a cost-effective solution to fully decontaminate the vehicle, equipment and the firefighters themselves (with use of respiratory protection), enabling teams to return to the station in uncontaminated suits.

The LDS utilises new Scott Safety atomisation technology to create a fine mist to ensure even and consistent coverage

and haptic dry surfaces. Rapidly projecting these droplets in the form of a dense and turbulent mist, the system is capable of delivering CBRN decontaminants to all non-line of sight surfaces. This process drastically reduces both the chemical footprint and time required for effective decontamination. Unlike many traditional decontamination systems which utilise liquids, this new process forces powders to behave like a gas, ensuring that sensitive and electronic equipment is not damaged.

Environmentally friendly and cost-efficient, LDS typically requires only five percent of decontaminant compared to traditional systems due to the gas-like behaviour of the small droplet mist. Easily directed and controlled with a lance hose, the system achieves a projection distance of up to 30 meters and is compatible with a range of chemistries.

The water payload of the LDS enables the system to be utilised for Class A and B Fire Fighting applications. For chemical and biological decontamination, the LDS is chemically agnostic so can use a diverse range of decontaminants including deliver of Alkoxides, Hydrogen Peroxide, Hypochlorous Acid, Peracetic Acid esters, Chlorine Dioxide, Sodium Hypochlorite and Potassium Peroxymonosulfate. Radiological and nuclear decontamination includes delivery of trippable coatings, fixatives and other sequestering liquids.

Following government plans to reduce the number of specialist decontamination units for fire and rescue services in England, LDS provides a highly mobile, scalable solution. For large scale infrastructure whereby longer duration or wider area capability of up to 2000m³ is required, Scott Safety also offers the Remote Decontamination System (RDS) which operates using a remotely operated 360° tripod to provide increased levels of decontamination efficacy and performance.

➔ For more information, go to [www.scottsafety.com/emea](http://www.scottsafety.com/emea)



Image courtesy of Scott Safety

## A GAME CHANGER IN DECONTAMINATION



### THE NEW PORTABLE AIRBORNE AND SURFACE DECONTAMINATION SOLUTION

The Light Decontamination System (LDS) represents a major advancement in CBRN decontamination. Offering lightweight and cost effective decontamination the LDS is a highly mobile and robust back pack designed for maximum operational flexibility. Designed to allow emergency personnel to work effectively in both confined and remote environments the LDS incorporates Scott Safety atomisation technology creating a superfine mist to ensure even and consistent coverage.

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For more information, visit [ScottSafety.com/EMEA](http://ScottSafety.com/EMEA)

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# HAIX Group

## Proudly worn by firefighters in Germany and across the globe

Xaver Haimerl founded the HAIX company in 1948, establishing the first shoe factory in Mainburg, Germany. The company quickly made a name for itself locally by selling hiking and work boots.

The brand evolved in 1992 when Xaver's son, Ewald (a deputy fire chief at Mainburg's fire service and a master shoemaker at the HAIX factory) found that his fire fighting colleagues were unhappy with the rubber boots they had to wear. Ewald took action and designed a collection of functional leather fire fighting boots for his comrades, commenting "The more I learned, I decided to take the problem into my own hands."

This work quickly garnered praise and recognition, leading Ewald to design and develop footwear for rescue workers and the police. By 1999, HAIX produced more than 100,000 pairs of shoes per year.

The need for a high-tech production facility became apparent, leading to a custom built factory in Croatia in 2009, with much greater capacity levels. In 2011, HAIX celebrated its six millionth shoes leaving the

production line. Annual production levels in 2015 reached 1,000,000.

HAIX has grown into an international brand renowned for its specialist approach combined with an unwavering stance on quality footwear. The brand is now also well established in the military, policing, emergency, forestry, and industrial sectors.

### Changing Firefighter Role

One of the biggest changes the industry is experiencing is the ever evolving role of a firefighter and the transition to more rescue based work. Previous stereotypes that summarized a firefighters' role as simply putting out fires have been shattered and there is a growing awareness of how varied the job truly is.

HAIX designed, produced and manufactured the Fire Eagle after witnessing these changes, offering a footwear solution that accurately reflected the work completed by firefighters. This boot boasts a sleek, sporty functional design- lightweight and flexible whilst equipped with all required safety features.

With the Fire Eagle, HAIX designed footwear that also served as a visual signal function, with the two- colour design acting

like a light in the dark when rescuers need to crawl one behind the other, entering confined spaces. This will mean they never lose track of colleagues in front of them and could make all the difference when worn in a real emergency situation.

As well as the Fire Eagle, HAIX offers a range of other footwear to the firefighting market to ensure the varied needs of firefighters globally are met. This range includes the Fireman Yellow- the preferred model for first time users, the Florian Europe - serving as the slip on boot for daily operations and Fire Flash, the most popular service boot with lace zipper closure.

Work is constantly ongoing to ensure these boots remain the best in the industry and models are adapted accordingly to changing demands. During the Fire Eagle launch, the boot was hailed as Fire Hero's 2 little brother. Similarly, cosmetic additions are expected to be unveiled on the Fire Flash later this year.

Ewald's first priority when designing footwear for firefighters in 1992 was to ensure that his comrades had the footwear they deserved and that it was an accurate reflection of their everyday roles and responsibilities. It is clear to see that this focus remains.

### Toughest Boots In The World

Firefighters in Los Angeles, New York, Hamburg, Mexico City, Moscow, Hong Kong and Tokyo all place their trust in HAIX boots. Why? The footwear is industry leading - comfortable, reliable and equipped with all of the required safety features irrespective of terrain. Popular German TV show Galileo recognised this and once said that HAIX produced "the toughest boots in the world".

HAIX continues to set standards with innovative designs created by the unrivalled expertise of the brand's technicians. HAIX has a proud history of working with firefighters for firefighters.

 For more information, go to [www.haix.co.uk](http://www.haix.co.uk)

▼ Ewald Haimerl,  
CEO of HAIX.



Image courtesy of HAIX Group



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This model has yielded a minimum of 25 jobs per 100,000 residents 4 years in a row. Example: Austin, Texas, would yield approx \$40,000 profit after gas, parts, advertising and a small referral fee. The average price for a regular 5' x 8' bath is only \$149.00, well below industry standards.



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# VIKING Guardian

## DuPont™ Nomex® partner develops suit innovation to protect firefighters

DuPont™ Nomex® Partner VIKING Life-Saving Equipment has developed a ground-breaking suit concept incorporating DuPont™ Nomex®, with a detachable outer shell, to help reduce firefighters' exposure to potentially harmful particles, resulting from combustion from a fire. In addition, this concept allows for easy cleaning. Contamination poses both a risk to the firefighter's health and to the degradation and performance of protective garments.

Showcased as a winner of the DuPont™ Nomex® Garment Innovation Awards at

Interschutz this year, VIKING Guardian is purpose-made to provide firefighters with an entirely new level of protection.

Incorporating DuPont™ Nomex®, the Hainsworth TITAN® outer shell can easily be removed by the firefighter after attending a fire, leaving the inner liner to be worn during debriefing and the return to base. Before getting into the fire engine, the outer shell is simply placed in a dissolvable washing bag. Contained in the bag, any residual particles on the garment surface are effectively cut off from close contact with firefighters and

their physical environment during transport, washing, storage and other routine tasks.

The VIKING Guardian is inspired by the multi-piece VIKING suits worn predominantly outside Europe. However, where those suits are primarily designed to avoid cross contamination during washing and ease of repair, the VIKING Guardian's design objectives went much further.

Firefighter comfort received special attention, with features such as pre-bent knees and elbows, a removable hood, and superior, adjustable flexibility to handle many different work situations. The highly durable suit is reinforced with DuPont™ Kevlar® in arms, knees, in the pockets, and at the hem of the pants and the jacket. Attention to detail is evident throughout the design, making it easier, for example, to don communications equipment.

"Comfort is a key part of ensuring safety," says Keld Valentin, "An uncomfortable suit may not be worn properly or even avoided where possible, reducing the wearer's level of protection from heat and contamination."

General durability was also important. A strategy behind the multi-piece design was the ability to extend the lifetime value of components. Making it possible to purchase a new lining or outer shell separately rather than discarding the entire suit if only part of it is damaged or worn.

One of just four companies recognised by the DuPont™ Nomex® Garment Innovation Awards, VIKING Life-Saving Equipment is part of the DuPont™ Nomex® Partner Program developed as part of DuPont's commitment to protection quality. It is a carefully-selected network of customer-oriented and progressive weavers and garment manufacturers whose fabrics and garments pass DuPont's rigorous quality controls. Other winners of the awards include S-GARD, TEXPORT and Bristol Uniforms.



▲ A winner of the DuPont™ Nomex® Garment Innovation Awards 2015.

◀ A detachable outer shell helps reduce fighters' exposure to potentially harmful particles.

Images courtesy of VIKING

For more information, go to [www.viking-life.com](http://www.viking-life.com)

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# BAE Systems, Warton, UK

## High-tech trainer keeps fire crews ready for action

**F**or specialist firefighters at BAE Systems' busy runway, the ability to hone their skills using the most cutting-edge training technologies is key.

And the team of 25 firefighters at the Company's own in-house fire service, based at Warton, Lancashire, is making use of the latest innovations at their purpose-built training facility near the site's airstrip.

The site's newly revamped high-tech Fire Ground Training Simulator replaces a previously used facility, which was both smaller and based on a hybrid of a civil aircraft and a Harrier jet.

Providing a rare glimpse inside the new facility, built to replicate the Company's 146 airliner, station Watch Manager Kieran Merriman, said: "The simulator is allowing the team to undertake the latest training techniques and build the specialist skills needed to deal with any incident."

Crews from the service are on standby during daily flights at Warton as well as

▼ Firefighters tackle a blaze during a training exercise at their specialist training ground at BAE Systems' Warton site in Lancashire.

test flights of some of the world's most technologically advanced combat and training jets.

And while the Company's aircraft, including Typhoon and Hawk, have an impeccable safety record, Mr Merriman says the new facility now ensures firefighters can access the most realistic on-site training possible should a real incident ever occur.

He said: "The new fire training simulator has been designed to provide the most realistic training environment possible for our firefighters."

"Having a facility on site allows the fire fighters to train to a high standard. This training ensures they are competent and prepared to work within the hazardous environments that they may encounter."

"The old facility was loosely based on a hybrid between a small civil aircraft and a Harrier. However, it was very small and didn't accurately represent the type of aircraft that we encounter at Warton."

"The new facility has been constructed around the same fuselage dimensions as the 146 aircraft. Therefore we are providing our fire fighters with a training

environment that is conducive to the largest type of aircraft that they are regularly likely to encounter."

The facility allows firefighters to take on outside and inside fire scenarios which may be encountered on a runway. Sensors inside the facility also allow trainers to monitor the exposure of firefighters to heat, ensuring the area is as realistic but safe as possible.

In the external areas firefighters can tackle fires on replica engine fire and undercarriages as well as fuel leaks, using live fire.

Meanwhile, the internal side of the facility simulates a structural collapse in an aircraft, allowing them to practice search and rescue techniques and use thermal imaging technology in the most realistic surroundings possible.

The use of live fire – using kerosene lit with a pilot light – means firefighters can train in the kinds of fire, smoke and heat conditions they would encounter in a real emergency.

Mr Merriman, who led on the facility's design, testing and installation, added: "Specialist training is required here in several significant areas. Specific to Warton, we train our firefighters around the military fast jets."

"The risks that ordinary firefighters face, broadly speaking, are known and well researched. A lot of what we do at Warton is cutting edge."

"The simulator here at Warton has been upgraded with the use of latest technology. This includes auto alarms that are connected to thermo-couples within the training simulator, which means that we can accurately monitor the exposure of our firefighters to the effects of heat, therefore providing a safe yet realistic and challenging environment."

"Additionally the four thermo-couples are linked into a computer that electronically records the internal temperatures. The use of Avtur (kerosene) as a fuel for burning is the most accurate and realistic available."

The training facilities are not the only



Images courtesy of Ray Troll, BAE Systems

### ROSENBAUER FIRE ENGINES AT BAE SYSTEMS, WARTON

- 6x6 wheel drive, allowing the vehicles to negotiate tough terrains.
- The fire engines can deliver 6,100 litres of water per minute – six times that of many standard fire engines.
- High powered roof monitors can empty the full tank in two minutes.
- Panoramic view windscreen and glass doors allows maximum field of vision.



▲ A mock engine fire at BAE Systems' fire service's training facility, which is set up to replicate a BAE 146 airliner (top). Some of the specialist firefighters based at BAE Systems' site at Warton (above).

impressive piece of equipment crews at Warton use. The site's fire service has a fleet of high-tech six-wheel drive Rosenbauer fire engines, which have off-road tyres designed to negotiate conditions at the end of the runway.

The 39 tonne vehicles can deliver 6,100 litres of water every minute. They can also carry 1,500 litres of foam and secondary media, including 225kg of dry powder.

Also recently completed is an off-road Argo Cat training area, ensuring firefighters can train on operation of their all-terrain Argo Cat vehicle and prepare their ability to handle the potentially difficult terrain which sits at either end of the Warton runway.

However, there are also many similarities between the crews at Warton and more 'traditional' fire services.

The team operates in four watches

Monday to Friday and they are on duty at the same time from 7am until 8pm.

On Saturdays and Sundays they have one crew which is on duty from 7am to 8pm.

"We are a traditional service in that we will have a formal parade at 7am when everyone will have the crewing read out to them," added Mr Merriman. "The guys will take the vehicles out every day and check all the levels, the tyres, water levels, oil and so on."

"It is then down to me to declare the scale of resources we need to provide to conduct flying that day. We will go into our training period from 8am until 9.30am every day. It could be theoretical, such as lectures on aircraft or radiation for example, and we also do practical training on our fire ground."

"We have also got an ambulance,

which is operated on a rota basis. We carry out daily checks on that and we respond to medical incidents and fire alarms across the site."

"We have 25 firefighters here and everyone is trained in emergency care. It is not quite to the same level as a paramedic but we are trained to respond to 'red' (emergency) incidents."

"When we are not doing those things, we have a lot of responsibility for fire safety around the site. It is a varied role."

➔ For more information, go to [www.baesystems.com](http://www.baesystems.com)



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## How the UK fire service is revolutionising situational awareness

The latest advances in thermal imaging and gas detection now enable firefighters to interpret a scene from safer distances, helping to eliminate the need for high risk 'fast attack' entry to burning buildings and keeping firefighters safer as they save lives.



**Tony Pickett**

**B**rought to the UK's fire services by Scott Safety, a leading innovator in equipment for firefighters and first responders, the technologies can be fixed, portable or even deployed via a robot to provide intelligence on the specific makeup of the fire and highest risk factors.

Developed to help build the 'bigger picture' of every incident and how to best tackle the blaze, new solutions have been developed to reduce user burden and incorporate real-time telemetry, situational intelligence and communications in hazardous environments.

▼ The X380N allows firefighters to fully interpret a fire scene and make better, safer, more tactical decisions.

Already a global leader in the design, manufacture and supply of respiratory protective equipment, recently Scott Safety acquired two companies whose design, technology and product creation capabilities complement and enhance those of Scott Safety: thermal imaging company ISG and gas detection specialist IST Group (GMI, Oldham, Simtronics and Detcon). In bringing these two world-class companies together, and with the launch of this new X-380 camera, Scott and ISG customers now have an exciting new range of thermal imagers from which to choose.

For firefighters entering the unpredictable environment of an inferno, the latest X-380 thermal imaging camera powered by ISG Technology, now utilises



Tony Pickett is Global Product Manager at Scott Safety.





both hot and cold spot tracking to enable firefighters to navigate in the safest areas. Using this technology, firefighters can instantly see and create paths through cooler spots and avoid the highest risk areas such as floors or ceilings likely to collapse in the blaze.

The cold spot tracker enables first responders to locate and pin point thread or valve gas leaks as gas in general will be colder in temperature than the environment surrounding it.

The X-Series X380N camera which is NFPA 1801 compliant, provides the perfect combination of technology, lightweight design, and robust features to enhance situational awareness. In addition to achieving NFPA compliance, the X380N offers high resolution detection, superior image quality, Intelligent Focus™ to clearly see at temperatures above 1000C° and transparent colourisation.

The X380N allows firefighters to fully interpret a fire scene and make better, safer, more tactical decisions.

The National Fire Protection

Association (NFPA) 1801 standard provides rigorous environmental and durability testing such as impact, flame and heat similar to SCBA durability tests. The standard also defines performance requirements around image quality and fixed location of onscreen symbology to enable training and facilitate mutual aid situations.

ISG has more than 20 years of thermal industry firsts and has always manufactured cameras to its own tough standards. Many of its original models like the Talisman and K-Series are still in operational use around the world today. The X380N camera is available through Scott Safety's network of global distribution partners

Manufactured in both the UK and US, ISG advanced thermal imaging cameras have fast become the camera of choice, winning all major UK tenders this year. In 2014, the company has gone from strength to strength, taking extensive market share from its competitors and traditional UK incumbents. For example, 54 X-Series

▲ Acting as the 'eyes' of the brigade, the portable ROV1 robot can be deployed to get closer to a burning building than is physically safe for firefighters.

cameras are now in operational use at Suffolk FRS and over 30 X-Series cameras are in use at Staffordshire. Both brigades, plus many others, have made the recent move to ISG to improve firefighter pre-emptive ability and safety.

UK brigades are calling the X-Series a tactical camera. Scott Safety has had great feedback from many of its UK customers who tell them firefighters are getting a much clearer understanding of a fire scene using the X-Series, compared to traditional thermal cameras. The X-Series enables firefighters to make better tactical decisions because it has a unique ability to provide clear and precise image data during firefighting.

Advancing the capabilities of these technologies, robotic technology is now working to reduce the exposure of human firefighters to fires.

## NEW: FLIR K2

### Extremely affordable thermal imaging camera for firefighters

The extremely affordable FLIR K2 camera helps you attack fires more strategically and find victims faster. Get the bright big picture and tactical advantage you need to see under the most challenging conditions. The K2 helps firefighters find their way through thick smoke, assess situations with confidence, and expedite decisions.



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- Multi-spectral dynamic imaging (MSX)
- Multiple firefighting applications

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Images courtesy of Scott Safety



▲ Scott Safety introduces CODFM; the first ever telemetry system to attach to a thermal imaging camera.

Imagine this scenario: A building containing potentially explosive cylinders is engulfed in flames, the sound of fire sirens drown out voices, and firefighters are putting their lives on the line close to the blaze.

But what if, hours before, the Incident Commander had deployed a small robot with a built-in thermal imaging camera and gas detector to gain a close-up view of the building? And what if those images were logged into a database and accessed by firefighters planning to tackle the fire?

This technological innovation is now being put to the test by British firefighters who are working with Scott Safety to integrate the latest thermal imaging and gas detection technology with the unit's ingenious ROV1 robot.

Acting as the 'eyes' of the brigade, the portable ROV1 robot can be deployed to get closer to a burning building than is physically safe for firefighters and provide imagery and data that would otherwise be unattainable. Using thermal imaging, firefighters can pinpoint the centre of the fire and essentially 'see' through the smoke to plan their extinguish plan.

Also used by the police force as a counter terror device, the robot will soon

incorporate gas detection technology. This is essential in situations where gas canisters are present to both evaluate the risk of explosion and to measure potentially harmful chemical combinations 'boiled up' in a fire. Going one step further, the ROV1 now uses the latest Cobra Cold Cutting Extinguisher which can break through a wall to extinguish or calm the fire, making it significantly safer for firefighters to enter.

### The future

Looking to the future, it is expected that more firefighting equipment will become wireless compatible and join 'the internet of things' where devices are linked together through the cloud. Items including gas detectors and thermal imaging cameras could then talk to each other. For example, location and gas detection data could be overlaid to enable the mapping of gas concentrations across an area in real-time, providing insight into the developing situation inside.

In the case of robotics like the ROV1, future wireless capabilities could enable firefighters to access buildings from even further away. Currently operated via an optical cable with a reach of up to 100m, the ROV1 is limited in the distance it can be deployed. In the case of cylinder fires or high risk explosive environments, wireless technologies could help mitigate the risk to firefighters and the public's lives even further.

In September Scott Safety introduced CODFM; the first ever telemetry system to attach to a thermal imaging camera. Previously, this technology has only been used on perimeter cameras outside of a fire scene. For the first time, firefighters will be able to view images of the inside of a burning building, providing an even deeper insight into the individual risks presented. This advancement in technology will enable fire officers to more accurately predict hazards such as flashovers and brief their team accordingly. Greater situational awareness is the future of firefighting and will help to ensure that every fire fighter comes home after the job is done.

Scott Safety is breaking new ground as recent acquisitions have enabled the company to discover connections between seemingly unrelated technologies or concepts to create brand new solutions.

This innovative approach opens up a world of new thinking. Could we be looking one day at headgear for example, that integrates a plethora of traditionally handheld technologies such as thermal imaging or gas detection, freeing up safety professionals get on with their jobs more efficiently?



For more information, go to [www.scottsafety.com/emea](http://www.scottsafety.com/emea)



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## Firefighter PPE procurement – the essentials

As high performance technical garments, firefighter protective clothing is required to deliver levels of protection and wearer safety which not only need to satisfy national and international performance standards but also trust in its integrity by those whose health, safety, and ultimately whose lives, depend on it.



**Richard Cranham**

**Richard Cranham is  
International Sales Manager  
for Bristol Uniforms.**

**M**uch has changed in the way today's firefighter PPE is designed and made as compared with as little as 15 years ago, and it is these product and performance developments which need to be understood by users when specifying garments for firefighters to ensure that the benefits, which the latest technology in fabrics and manufacturing methods are able to provide, are fully realised in the procurement process.

There are a number of elements which contribute to the overall capability of a supplier to deliver to the world class standards widely accepted as essential to ensuring safe working for firefighters whether involved in structural, wildland or technical rescue operations. The purpose of this article is to look at each of these to demonstrate their respective contributions to overall service delivery.

As a manufacturer, the process begins with having a team of skilled professionals with a combination of technical and design expertise and experience. Within this skill set will be an in-depth understanding of materials, their characteristics and behaviour during both the manufacturing process itself as well as the testing procedures carried out on completed garments where two, or more, layers are involved in the construction. It is the skill of the designer to be able to translate a customer's requirements into a product specification which meets both these as well as the



◀ **Bristol LayerFlex™**  
in 3DP outercoat  
with high vis yellow  
**RescueFlex™**  
undergarment.

Image courtesy of Bristol Uniforms





Image courtesy of Bristol Uniforms

▲ Bristol XFlex™  
in PBI Matrix.

performance required by national or international standards.

Given the primary purpose of firefighter garments to protect the wearer from external risks associated with exposure to heat, flame lick, flashovers, water ingress and, where appropriate, blood borne pathogens, it is essential to design garments in a way which will minimise skin and body exposure through the optimal reduction in transmission through the garment. Coupled with this is the need to alleviate the known health risks from the physiological responses of the human body to being enclosed within the garment and its ability to allow

heat and moisture vapour to escape to minimise operational heat stress and discomfort from sweating. Designing garments to address the complex combination of risks emanating from outside and inside the garment is key to creating high performance PPE.

Firefighter garments are bespoke items of clothing with every coat and trouser being made to measure. Optimal protective performance can only be assured through using a comprehensive sizing procedure which ensures the individual wearer has well-fitting garments. In addition, the operational requirements of individual fire and rescue services will be reflected in the detailed specifications drawn up by their procurement team. The wide variety of options available to meet these particular preferences include alternative types of trouser front and leg openings and knee pads as well as cuff styles on fire coats. Other options include detachable linings and knee and elbow reinforcements. Operational safety features such as integrated safety harnesses and drag rescue devices are sometimes specified. Breathable reflective tape is used to improve the overall moisture transmission out of the garment whilst Trimsaver is a thread encapsulating technique used to protect the thread from abrasion and reduce garment wear and repair. Firefighter accessories including tools, lighting and communications equipment all have to be carried safely requiring the provision of a wide range of loops, straps, D-rings, glove hooks as well as pockets and flaps which add further to the large number of permutations which form part of the bespoke nature of PPE design.

A further consideration is the need for fire services to present a professional and clearly recognisable identity to their communities. Colours and badging feature increasingly in procurement specifications. This has led to the introduction of a range of new fabric colours and the increased use of Velcro fixings for identification badges with logos, names and roles being individually catered for and easily replaced when an individual's PPE needs to have a name, rank or job title changed. Whilst blue and gold have been the traditional dominant colours for PPE, reds, yellows and greens are becoming more popular

and frequently used in combination for emergency services protective garments.

The characteristics of the natural and synthetic fibres used in the manufacture of specialist PPE fabrics all play a key role in determining the finished garment's protective features. World class performing outer fabrics display different characteristics when exposed to heat and flame and will be selected during the procurement process depending on a user's preferences. DuPont Nomex® and PBI Performance Products offer fabric weavers fibre alternatives which become part of the range of outer layers available as Nomex®, PBI and Hainsworth TITAN fabrics whilst other fibre producers and weavers offer a further range of options. W L Gore are the principal suppliers of the most commonly specified moisture barriers which come in a variety of fabrics in their GORE-TEX® and CROSSTECH® ranges. Thermal barriers used as the inner lining of structural fire kit are either quilted Nomex® barriers or Hainsworth ECO-DRY linings.

Firefighter PPE is offered in a wide range of styles. Each manufacturer designs garments in a range of models which they consider most appropriate for their served markets. Available options should recognise the need to offer specifications to meet the budgets available to fire and rescue services in different countries. In some parts of the world, single performance standards prevail whilst in others, for example in Europe, structural firefighter kit can be offered at two levels – EN469:2005 Level 1 and 2. Additionally, the broadening scope of firefighter activities, including technical rescue and wildland firefighting, has seen the introduction of more specialised garments specifically designed for different operational environments. Given the current level of choice in firefighter garments meeting the relevant standards requirements, the procurement process should seek to exploit the innovative capabilities of alternative suppliers. In so doing, manufacturers will be encouraged to focus attention on new product development leading to a wider choice of cutting edge garments to the customer's benefit.

Personal protection in hazardous occupations, amongst which the emergency services rank as having exposure to some of the greatest risks

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► Bristol  
RescueFlex™.



Image courtesy of Bristol Uniforms

outside of the military, clearly demands that garments are rigorously tested by independent test facilities. This will ensure that they fully meet the performance standards firefighters expect, and rely upon, to protect their health and safety whatever front line conditions they encounter. Special

test rigs have been designed to carefully measure the performance of garments. These include strength and permeability tests for fabrics and composite constructions such as those provided by the British Technology Testing Group (BTTG) in the UK. Fire tests

are carried out using special manikins which simulate a variety of fire ground scenarios and measure heat and flame penetration. The DuPont™ Thermo-Man® fire test rig in Switzerland is one example whilst BTTG use two heat sensing manikins, RALPH and SOPHIE, male and female garment rigs which comply with the manikin test standard ISO 13506.

Reference was made earlier to the importance of standards in connection with the various types of garments manufactured to protect firefighters across all areas of activity. The standards which cover the main regions of the world are European (EN) and North American (NFPA). Other areas which have their own versions of one of these standards include

Australia and New Zealand. Standards are developed by working groups comprised of experienced and technically qualified representatives drawn from all parts of the industry including fibre manufacturers, fabric weavers, PPE manufacturers, independent test houses and fire and rescue services. Bristol, through contributing the expertise of its technical teams, has been involved in this work from the time of the original UK standards in the 1980s and in European standards since the inception of EN standards in 1995.

Bristol, as a global supplier, has developed a range of styles to suit operational environments ranging from cool temperate to tropical regions of the world. Utilising the scope provided by the range of alternative fabrics now available on world markets for the manufacture of firefighter protective garments, new concepts, such as Bristol's XFlex™, have emerged in recent years to meet these needs more directly. Clearly, given the 3-layer construction of structural garments, the issue of minimising wearer heat stress is more critical in warm temperate, sub-tropical and arid climates as well as tropical and equatorial climates. Bristol's LayerFlex™ is one solution. Using a layered approach, the lower levels of protection needed for technical rescue and wildland firefighting are provided for through the use of an under coat which is boosted to structural EN469:2005 Level 2 by the addition of an over garment. In this way, and by incorporating the latest lightweight fabrics, body heat build-up can be minimised.

It is clear that, in order to optimise the improved comfort and performance offered by the latest designs in firefighter PPE, suppliers and procurement teams should work increasingly closely to ensure that specifications, particularly in tender documents, provide scope for suppliers to discuss the various options available. Innovation brings with it opportunities to improve overall performance and deliver cost savings. Extending the service life of PPE through the use of managed services can bring further economies at a time when public sector budgets in many countries around the world are under close scrutiny.

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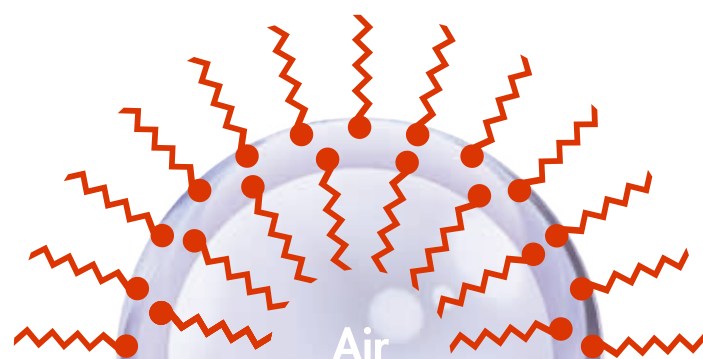
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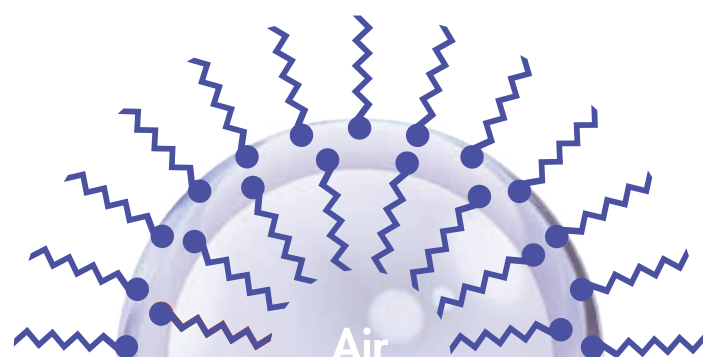
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(Hydrocarbon tails are fuel-loving)



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## Liquid Natural Gas (LNG) training for first responders: Part 1

Marine Firefighting Inc. has been training Mariners and Firefighters about Liquid Natural Gas (LNG) safety and firefighting tactics for over 14-years. This training had previously been conducted for the few large LNG import terminals in the US. Eventually, the US located massive amounts of natural gas within our own borders. So much so, that we will now be exporting this super cold product instead of importing. Facilities are being converted to now export LNG and many more new facilities are under construction or consideration.



**Tom Guldner**

Tom is a retired Lieutenant of the New York City Fire Department's Marine Division and is a Principal Member of the NFPA Technical Committee on Merchant Vessels. His company Marine Firefighting Inc. is involved in consulting and training mariners and land based firefighters in all aspects of marine fire fighting.

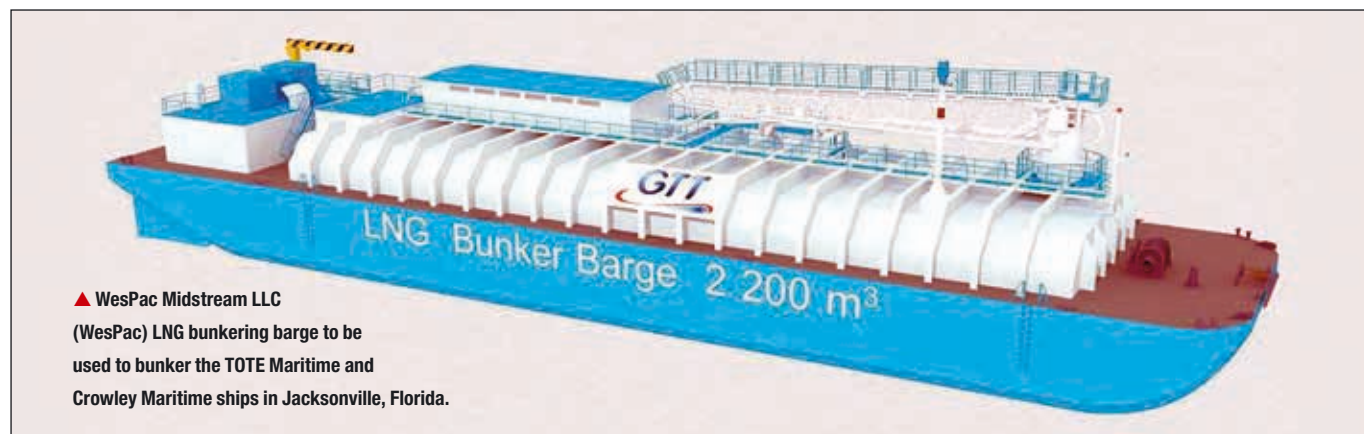
**T**hese large import/export facilities have been the subject of several of my previous articles. Many innovative fire detection, prevention, and suppression systems have been incorporated in these facilities. Firefighters and other first responders needed extra specialized training to deal with the hazards found at these facilities. For the remainder of the first responders who were not located near these facilities there has been little or no need for LNG training. But that is changing.

▼ Tom Guldner, President of Marine Firefighting Inc. instructs a classroom of Jacksonville, Florida First Responders in the properties of LNG and safety during emergency responses.

Another result of the new deposits of natural gas, both in the US and also around the world, is that because the supply is now greater than the demand, the price of this clean burning fuel has dropped to half its former price. Due to this cheaper LNG it is therefore now a viable and cost effective alternative to standard heavy fuels. Because of the price reduction LNG is now not only being used to power our ships and smaller vessels, but also our buses, trucks, locomotives, and even construction equipment. Consequently, many first responders who did not have to worry about dealing with LNG fires and emergencies will now have to learn and equip themselves to deal with this issue.







Many Fire Departments may not even be aware of LNG re-fueling stations in their response area or that LNG may be traveling through their districts on railroad tank cars and tractor trailers. Even vehicle fires may now have an LNG hazard because many of the vehicles will be powered with LNG. But, for now, let's get back to the ships and boats.

The marine industry has another reason, other than cost, for looking to LNG as a vessel fuel. Very strict environmental regulations have been, and are continuing to be placed on vessel emissions. The marine industry does not have too many alternatives to the heavy fuel oils and diesel fuels it has been using in the past. It can attempt to clean up the emissions by treating the flue gasses being emitted from their vessels which are using the current fuels but this is very costly and it may not meet the expected, more restrictive, future regulations.

Several forward thinking companies have realized that LNG is the only viable alternative and they have been building ships, ferries, and service vessels that will be fueled by LNG. It was a brave step because for many years there has been a, "chicken or the egg" equation which has stymied the advancement of LNG as a fuel. The shipper said, "If I build LNG fueled ships and there is nowhere to fuel it up I will not be able to use my ships". The LNG industry said, "If I build the bunkering (re-fueling) facilities and no one builds the LNG fueled ships my facility will be idle."

Well, after several years of that argument preventing any movement in the LNG as a fuel dilemma several companies have come together to "bite the bullet" and forge ahead.

Totem Ocean Trailer Express (TOTE's) Sea Star Line has built two LNG fueled ships which will operate from Jacksonville,

Florida to Puerto Rico. To re-fuel these vessels in Jacksonville, JaxLNG, (a partnership of WesPac Midstream LLC and Pivotal LNG) has started the process of setting up LNG bunkering in their port.

The re-fueling will eventually be done at a dedicated LNG bunkering facility to be constructed in Jacksonville. Until that facility is completed the first re-fueling operations will be done from an LNG tanker truck and later from an LNG bunkering barge which will be brought in until the permanent facility is completed. The first ship bunkering is scheduled for October/November 2015.

Another shipping company, Crowley is constructing two of their own ships to also operate out of the Port of Jacksonville and run to Puerto Rico. These combination container and Roll-On/Roll-Off (ConRo) ships will be in service sometime in 2017.

TOTE's is also converting two older ships to run on LNG. These vessels will work on the other side of the US out of the Port of Tacoma, Washington. Marine Firefighting Inc. just took part in consulting on the Port risk assessment for the Tacoma Fire Department.

Tacoma will have an LNG bunkering facility and TOTE's LNG powered vessels will run from Tacoma to Anchorage, Alaska. Until that facility is completed the TOTE ships will be re-fueled by a bunkering barge (photo left by WesPac) which is being built by California's WesPac Midstream and an affiliate Clean Marine Energy, based in The Netherlands. It will be a 2,200-cubic meter (about 580,000 gallons) LNG barge that will be deployed in early 2016 in Tacoma, where it will serve the 2-TOTE-owned vessels. The bunker barge will eventually be moved to the Port of Jacksonville, Florida, where it will also serve the two new TOTE vessels mentioned before.

All of the companies involved in this Jacksonville project wanted to insure

that LNG bunkering would be carried out in the safest manner possible. To this end my company, Marine Firefighting Inc. joined with Gas Technology Institute to deliver an LNG Awareness and LNG Bunkering Safety program to the First responders in Jacksonville.

The program was developed specifically for Port of Jacksonville area stakeholders, especially local first responders, and included firefighters from the Jacksonville Fire Rescue Departments, the U.S. Coast Guard Sector Jacksonville, and local area law enforcement agencies. This training was the first step in the future LNG specific training for both mariners and First Responders dealing with the LNG bunkering and storage facilities planned for Jacksonville.

Many areas in the US, Canada, Europe, and in almost every country are using LNG now or are in the process of starting up some form of LNG operation. Very often first responders are either not considered in the training or may have to set up their own training programs. For LNG emergencies to be handled safely all stakeholders should be trained and drilled in a coordinated manner.

This program was an awareness level class dealing with the properties of LNG. The first responders received detailed descriptions of the characteristics of LNG which not only make it a great choice for the marine industry but which will also require specific knowledge, training, tools, and tactical changes to normal firefighting operations. In fact, all first responders will need to make some procedural changes.

In part 2 of this article we will discuss exactly what changes the Jacksonville, Florida first responders were instructed to make.

For more information, go to [www.marinefirefighting.com](http://www.marinefirefighting.com)

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# The value of proportionate advice in chemical incident response

With the chemical industry expanding into new regions across the world, chemical supply chains are now wider than ever. When responding to chemical incidents, fire services must be prepared to encounter a growing number of potentially hazardous substances, each with their own bespoke handling procedures. However, while the chemical industry is growing many fire services are finding their budgets shrinking, requiring crews to reduce the time and cost of deployment for each incident.



**Maria Stearn**

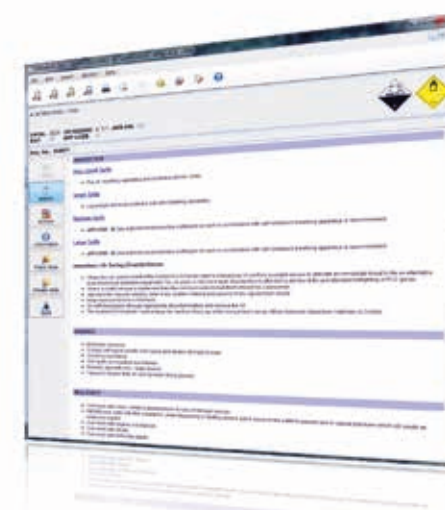
## Supporting global supply chains

Fire services play a dual role in the global chemical supply chain. With one hand they fulfil their primary duty of protecting members of the public from the risks of hazardous chemicals transport and use. With the other, they provide security to the markets that connect manufactures, distributors and end users across the world. Today, the value of emergency response is recognised as a core component for stability and growth in chemical export, not only for developed nations but in emerging regions around the world.

▼ Fire services are prepared to tackle major chemical incidents, even though they are statistically much more likely to be called out for spills less than 1 litre in volume.

However, the immediate impact of this globalisation is that potentially hazardous products are emerging onto the market at a faster rate than ever before. When attending a chemical incident, emergency response crews must be prepared to encounter a vast number of substances with a range of different chemical names, brands and formulas, each with diverse hazards and handling procedures. Chemical hazard databases that provide up-to-date information on every substance likely to be encountered in the field are therefore key components in fire services' incident response arsenal.

Emergency responders must also balance this commitment to rigorous response with the need to reduce the time of deployment. This is increasingly important, not only to free capacity for



emergencies but to reduce the cost of deployment, particularly where fire services operate within fixed or diminishing budgets. Adapting chemical databases to deliver more practical and proportionate advice has been identified as an effective way to help crews reduce the time and cost of chemical incident response while maintaining the safest procedures possible.

## The value of proportionate advice

The hazards posed by a chemical substance vary significantly depending on the volume and nature of the spill. By considering hazards not only in terms of chemical properties but also in relation to spill volume, fire services are able to select precise response procedures and avoid unnecessary deployment of personnel or equipment.

For example, the UK's National Chemical Emergency Centre (NCEC) classifies nitric acid, a substance widely used in many processes including fertiliser, dye and pharmaceutical production, as a highly corrosive material which reacts strongly with metals to produce toxic nitrogen dioxide fumes. In responding to a nitric acid spill, NCEC recommends a range of personal safety precautions and handling procedures. These include standing upwind of the incident to avoid toxic inhalation and never pouring water into concentrated nitric acid, as the resulting vapour pressure will create a serious explosion hazard. It also recommends the personal protective equipment (PPE) necessary for handling an incident: liquid tight suits for spills of less than 25 litres and gas tight protective clothing for anything larger.

Large spills of nitric acid therefore pose immediate risk to members of the public, the environment and emergency responders. However, while fire services

◀ By basing chemical hazard advice on spill volume, Chemdata allows fire services to provide safe, proportionate and effective incident response.

▶ Chemdata is available in five different languages – Arabic, Dutch, French, German and Spanish – and on iOS and Android operating systems to provide advice directly in-the-field.



must be prepared for a major incident they are statistically more likely to be called out for smaller spills. In many cases, this significantly changes the level of response required. When responding to a spill of nitric acid less than 1 litre in volume, NCEC recommends using a fire kit, breathing apparatus and protective gloves and boots rather than a chemical protective suit. The advantage of this is clear; the level of PPE preparation is less time intensive for a very small spill and less restrictive on the movement of the responder. Such proportionate advice therefore improves response times at each stage of the incident handling lifecycle, particularly during decontamination. Knowing when to thoroughly decontaminate equipment and collect run off water or simply wipe down a dry suit translates to a significant saving in time, freeing resources for more valuable deployment.

Scheduled for early 2016 release, NCEC's updated Chemdata chemical database will help fire services to cut the time and cost of attending chemical incidents by expanding its advice to include spills less than 1 litre in volume. Designed for use in moments of emergency, Chemdata is a global, multilingual service that provides instant access to detailed information on over 58,500 chemical substance and 171,000 product names. Available on desktop, iOS and Android operating systems, the tool provides practical and proportionate advice to help fire services make split second decisions in hazardous chemical environments, whether implementing snatch rescue operations or responding to minor or major spills.

Chemdata is developed with the direct input of fire service and emergency responders from around the world. For

over 30 years the system has provided industry leading information on the chemical hazards and reactivity, necessary PPE, precautionary actions, environmental priorities and essential first aid required to handle chemical substances. Chemdata also provides general advice on contemporary topics in incident response. This includes advice on emerging trends in the chemical industry, including fuel cell and clean transport technology, and guidance on handling incidents of chemical misuse, such as explosives or narcotics manufacture.

## The changing face of industry

As the chemical industry expands, governments, emergency services and private sector organisations across the world are coming together to improve safety provisions for chemical supply chains. Access to proportionate chemical advice plays an important role in helping fire services accommodate this expansion while preserving efficiency, whether responding to spills the size of a lorry load or those no larger than a pin drop.

This advice must only be provided by a credible and trusted source, as mishandling even a pin drop of some chemical substances can have tragic consequences. For more than 40 years, NCEC has worked with emergency responders and industry experts to provide comprehensive information on industrial and household chemical emergency response. By expanding the Chemdata solution to offer a greater degree of proportionate response, fire services are now able to optimise each step of the incident lifecycle, without a trade-off in rigour or security.

➔ For more information, go to [www.the-ncec.com](http://www.the-ncec.com)



Maria is product manager at the UK's National Chemical Emergency Centre (NCEC). She is responsible for developing Chemdata, NCEC's global database that provides emergency responders instantaneous advice to safely respond to chemical incidents.



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# Where the rubber meets the road: the importance of tyre husbandry

A tyre failure is an inconvenience for a commuter looking to get to work on time.

For firefighters, such an event can be the difference between life and death.

What steps should services take to keep firefighters safe on the road?



**Dan Lamb**

**F**irefighting is a tough job; so it goes without saying that anything associated with the profession needs to be equally tough: protective equipment, helmets, ladders, hoses – you name it. The same is true of the fire appliances the public rely on in their time of need – and of the tyres those vehicles roll on.

For fire services around the world, there's no more important piece of equipment than their fire appliances. These trucks are put under stresses that other heavy vehicles employed by road haulage firms will simply never face. Under blue light conditions, fire appliances need to corner harder, retain traction in the worst weather, accelerate at a moment's notice and transport a heavy load of crew, water and equipment faultlessly, efficiently and safely.

▼ Michelin is leading the way in recommending a switch to the larger 315/70 tyre size.

In order to meet these requirements, Michelin has developed technologies and working practices that are suited to the uniquely challenging nature of a firefighter's work – and it all starts with weight.

## Economies of scales

Unlike road transport firms, which have to consider the correct tyre pressures for vehicles running both fully-laden and empty, fire appliances have one advantage when it comes to establishing tyre pressures – they're almost always running at about the same weight.

While this makes finding and maintaining optimum tyre pressures easier for fire services in the long term, it also throws up a unique set of challenges.

To illustrate: whenever a new vehicle type joins a fire and rescue fleet that Michelin works with, the company's technical team puts the vehicle on the scales – complete with its normal crew complement, fuel, water, foam and equipment.

By subsequently weighing each wheel position individually to establish the vehicle's axle loads, pressure suggestions are developed to provide optimal handling, stability and grip, whether the vehicle is moving at speed or heading home sedately following a call-out.

This weighing process also allows services to get the best from their tyres in terms of mileage performance and longevity, via tyre pressure management – although, naturally, this isn't the key focus for most services, despite the ever-present pressure to reduce costs.

In fact, when it comes to tyre pressure management for fire and rescue services, the difficulty lies not in total weight, but weight distribution.

Fire services frequently aim to standardise the positioning of vital, life-saving equipment across vehicle types. With time always of the essence in an emergency, finding that vital bit of kit in an unfamiliar vehicle could be key. However, such a practice can also leave individual vehicle axles overloaded or underutilised, putting too much load (or too little) on their accompanying tyres.

Fire services should work with their tyre provider and vehicle manufacturer to examine weight distribution from an early stage. This would allow services to "spread the load" where possible, to ensure longevity, traction and handling in all conditions, without degradation of service or safety.

This issue of weight distribution is often more acute for services operating smaller vehicles, such as those rural services that are regularly faced with country lanes, mud-splattered corners and miles of track without a lamp post in sight. These vehicles still have to carry large amounts of equipment, and therefore tend to operate closer to their maximum gross vehicle weight. This then means that they have less spare capacity on the individual axles.

However, away from the vital need to find and maintain the correct tyre pressures and weight distribution on vehicle types across a fleet, consideration should also be made for selecting the appropriate tyre sizes, tread patterns and fitment policies.

## Tread new ground

For many UK fire services, the move to 315/70 R 22.5 tyres (315 being the nominal section width of the tyre in millimetres,

## New tyre strategy for Scottish Fire and Rescue Service

The Scottish Fire and Rescue Service is benefiting from improved tyre life, durability and traction for its frontline appliances after adopting the latest generation truck tyres.

The service became the first emergency service in the UK to fit a set of 315/70 R 22.5 Michelin X MultiWay 3D XZE all-position (steer) tyres in 2011. Five years on, the fitments are still fitted after more than 58,000 km in service and are projected to achieve in excess of 71,000 km – an approximate 94 per cent increase in mileage performance over the previous fitment.

Fleet Manager Scott Roberts pioneered the shift from 275/70 R 22.5 XZE2+ tyres – previously the favoured tyre size for an 18 tonne fire appliance – and says that the move to larger tyres, combined with the new Michelin tread pattern, ticks all of the boxes.

Critically, the all-position X MultiWay 3D XZE tyres feature M+S and 3PMSF markings, highlighting their ability to deliver traction on snow and in mud.

Previously, even urban-based appliances on all-position tyres could struggle for traction in challenging conditions. However, the new tyres' credentials enable the Scottish Fire and Rescue Service to specify all-position tyres as an all-round fitment on new heavy appliances – even those for rural areas, which previously required drive pattern tyres to ensure sufficient traction when road conditions deteriorate.

As well as fitting the latest generation tyres on its 18 tonners, the Scottish Fire and Rescue Service is also fitting Michelin's new X Multi range of tyres on its smaller 15 tonne trucks. 285/70 R 19.5 X Multi Z tyres have been specified as original equipment on 15 new Volvo appliances.

The new X Multi Z tyres stand out for being safer, more fuel-efficient, quieter and longer-lasting than the previous generation Michelin XZE2s they replace.

► The service was the UK's first to fit a set of 315/70 R 22.5 Michelin X MultiWay 3D XZE all-position tyres in 2011.



Image courtesy of Michelin

70 the height of the tyre sidewall as a percentage of the nominal section width and 22.5 the nominal diameter of the wheel rim in inches) for larger appliances has been slow, but is gaining pace.

Michelin is leading the way in recommending a switch to the larger tyre size, as 315/70 tyres feature a wider nominal section width than the smaller 275/70 R 22.5 tyres previously favoured by services, providing a wider contact patch, and therefore a greater contact area

with the road surface. This promotes even wear, with a high degree of tyre stability for improved vehicle handling – vital for blue light work.

These larger tyres also help with the weight distribution issue. The tyres offer up to 8 tonnes of load-carrying capacity on the front axle, a significant increase over the 6,300kg carrying capacity of the 275/70. This means that even with the increase in front axle loads due to the engines' Euro VI emissions equipment,

Dan Lamb is a Technical Manager at Michelin covering the north of England and Scotland, alongside fire and rescue and government contracts. Previously an Account Manager working with truck fleets, Lamb is a regular visitor to fire services and road transport firms, using his 22 years of experience within Michelin to ensure customers get the best from their tyres.



Image courtesy of Michelin





Image courtesy of Michelin

▲ X MultiWay 3D XZE tyres feature M+S and 3PMSF markings, highlighting their ability to deliver traction on snow and in mud.

the 315/70 can cope with the weight transfer from hard cornering and heavy braking common when the sirens are sounding. Previously, when using the smaller tyre, these appliances could suffer from excessive understeer when the front axle loads were at the limit.

The Michelin approach to this tyre selection conundrum is a focus on ensuring the optimum tyre pressure is established and maintained for all axles, using a dedicated calculation specially derived for emergency response vehicles by the Michelin Technical Team. This ensures optimum traction, handling and stability. This, where possible, is accompanied by dynamic handling assessments, to fine-tune the vehicle handling characteristics.

However, selecting the correct tyre for the job doesn't stop at tyre size – there's also the tread pattern to consider.

#### Fit the pattern

Historically, UK fire services fitted identical tread patterns to both axles, as this offers the best handling balance. Then – following some particularly challenging winters – some services, particularly in the north of England and Scotland, instead opted to fit

drive-pattern tyres to the drive axle, and steer-pattern tyres to the front. While this compromise had a marginally negative impact on vehicle handling balance, it provided improved traction on snow-covered roads, ensuring appliances made it to the call safely, quickly and reliably.

Today, tyre technology has advanced to a point where fitting the same tread pattern to both axles can again be considered, even for challenging conditions.

To illustrate, Michelin's latest-generation regional X MultiWay 3D XZE all-position (steer) tyres carry both the Mud + Snow (M+S) and Three Peak Mountain Snowflake (3PMSF) markings.

Traditionally an M+S tyres' tread design generally had lateral grooves in addition to the circumferential grooves found on 'standard' steer tyres, and are specially designed to improve performance in mud and fresh or melting snow. The 3PMSF symbol, meanwhile, is only applied to tyres which meet the requirements specified within ECE regulation 117 for traction and braking in defined snow conditions – all of which adds up to a better vehicle handling balance when fitting multi-position tyres on each axle, and with minimal impact on traction in bad weather.

As a bonus, fitting only one type of tyre means storing only one type of spare, ultimately cutting costs and streamlining the supply chain.

#### Top tips

To conclude, here are my 'top tips' for fire service tyre husbandry best practice:

##### 1 Select the right tyre for the job

In consultation with the appliance manufacturer and tyre supplier, services must first consider the particular vehicle's desired application. Once this has been established, the manufacturers can provide suggested tyre sizes for the vehicle as well as an appropriate tread pattern.

##### 2 Weigh your vehicles

Following the selection of the tyre type, services should have their vehicles professionally weighed. Once the technical weighing exercise is complete, the tyre manufacturer's technical team should be able to offer bespoke tyre pressure settings for each axle on the vehicle type.

##### 3 Maintain optimum tyre pressures

Services should adopt a consistent maintenance programme to ensure these pressure settings are maintained, while also making sure the tyres comply with legislation in terms of tyre condition. Services could consider making tyre maintenance part of the crews' daily routines as a team task, with responsibility shared among crew members.

##### 4 Review your tyre policy

Utilise the tyre manufacturer's technical expertise to review and optimise your existing tyre policy. The Michelin technical team collectively has more than one hundred years of tyre industry experience with the company. Paying a little more at the point of purchase can bring multiple benefits in terms of increased tyre life, improved fuel economy, reduced downtime and, particularly in bad weather, enhanced mobility and safety. The difference in tyre performance from one brand to another can be significant

Firefighting is a tough, demanding job, but tyre husbandry needn't be. Advances in tyre technology, combined with proactive, in-depth analysis and regular maintenance, can help fire services get to the call quicker and safer than ever before. All that's required is some careful thought as to precisely what rubber your appliances should be rolling on.

➔ For more information, go to [www.michelin.co.uk](http://www.michelin.co.uk)



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# Extrication – the importance of correct Personal Protective Equipment (PPE)

So as the 'shout' comes in and you get dressed in the appliance bay ready to attend an incident or you are in 'isolation' before your run at a RTC Challenge you will all be wearing PPE of one form or another. Generally this will consist of full firefighting kit or rescue kit, helmet with visor, eye protection, gloves (with medical gloves underneath), dust mask and boots.



**Paul Maynard**

Paul Maynard is an Area Manager with Royal Berkshire FRS and the current Response Manager. He is still active in the development of all RTC training and equipment within Royal Berkshire. He has been a member of the Royal Berkshire Extrication Team for nearly 20 years and led the team to three successive World Rescue Challenge titles from 2011–2013. Paul is now an Assessor for the United Kingdom Rescue Organisation (UKRO).

**T**he likelihood is that most of us will have and seen different types of firekit and that even your neighbouring service will have different styles to each other and at UKRO Challenges I have seen all manner of overalls and kit. So, what is right! I suppose that is predominantly down to you and your service but as we discuss this further, I would hope that this will promote discussion and encourage some of you to get more involved with kit procurement.

PPE is an area that is often discussed and it is also an area that has evolved greatly in recent times is. However, most FRS now have procured contracts that are managed for you and generally last for a

number of years and so regular change is not always an option. Having said that, our PPE today has excellent qualities and can come in many styles and colours, but depending on your FRS, you may attend RTC's in standard fire kit that is worn at all incidents. As technology has moved on in all areas of equipment, so it has in clothing and now we have specific designs in wildfire, USAR and of course rescue.

In my 28 years on the run as a firefighter and officer as well as the 20 years as a member of the RBFRS Rescue Team, I have seen many types of kit used. It is at UKRO/WRO events that you will see teams from all over the world wearing all manner of kit, some of

▼ Overalls and Jacket worn by RBFRS Heavy Rescue Team



▼ Firekit worn by all RBFRS crews at an RTC







Image courtesy of Holmatro

it good and some of it not so! However, it always promotes good discussion and especially abroad will lead you into discussions with manufacturers that are often exhibiting at these events. This has led to me being directly involved with some of the major PPE companies assisting their research and development. Also, these manufacturers assist in promoting some of these challenges so if you get a chance it is always worth having a discussion. It is also up to you to take what is new and perhaps “the way forward” back to your own FRS procurement teams and get involved in shaping the future for your service.

I am going to have a look at some of the PPE that is available to us and what we wear on the road and at challenges and what could work and offer us. I am also going to look at what equipment we should also have at incidents that is not directly PPE but is vital in our operations that provides safety to us and the patients we are rescuing.

#### Fire Kit or Overalls

In this case you are limited to what your FRS provides, but as your service looks to procure new kit, in my opinion the way

forward is overalls. A number of services use these already and from my discussions with them, they are much preferred.

Generally they are much more lightweight and less bulky, ensuring that if the need requires you can squeeze into that tight space before time is available to create space. There are many designs available and you can have what you need added such as pockets, knee pads and built in loops and I also like a method of pulling in the end of the sleeves and legs such as elastic or Velcro.

In RBRFS our extrication team wear Derby-Unitex overalls as does our Heavy Rescue Unit who also has the addition of a jacket depending on situation, incident type or weather. We have found these to be an excellent addition to our PPE and our crews like them and having worn them myself I fully agree with them!

One item that I consider invaluable though not PPE but does link in are tool belts. In RBFRS we carry 2 on all appliances that the technical team will wear. As well as carrying a numerous array of hand tools they are also ideal for carrying spare PPE such as extra blood gloves/glasses and are much easier to access than a flapped pocket.

▲ A typical RTC showing PPE and casualty care equipment in use.

#### Helmets

Going back a number of years, we tended to have large bulky helmets and you would often see a number of them on the roof of a vehicle as we were working, but today there is a huge choice available and most are very snug fitting and comfortable. Most come with various in built glasses and visors and it is best practice that the glasses stay down for the whole extrication and the visor is generally only used for hydraulic operation and glass management. I do see a number of extrication teams wearing separate glasses instead of the built in ones as they are generally smaller and more comfortable and also do not steam up as much. Our extrication team wear Bolle ones and they are extremely good and fit for purpose. If you do find the glasses and visors steaming up there are a number of products on the market such as ‘fog off’ which help keep them clear. In RBFRS we wear the Rosenbauer helmet and our extrication team wear Targa.



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### Gloves

Again these have evolved over the years and there are now many styles available. Most services have gone away from having one generic glove and now offer a rescue/extrication glove as well. My own personal favourite that I have used in the extrication team for many years, are Ringers which are extremely strong and puncture resistant. They have excellent dexterity and the palm and fingers are abrasion resistant and also an elasticated wrist that keeps out glass and debris. A number of extrication teams use them but anything that has similar qualities of these and you won't go far wrong.

### Dust mask

These need to be fit for purpose and are generally only worn for glass management. They should always be put on as a matter of course and then just lifted into place as and when required. There have been many discussions across the world around the issues of glass dust and some countries have gone away from wearing them though in my opinion we should err on the side of caution until otherwise proved. In RBFRS we use the Sundstrom SR100 with a P3 particle filter and we actually ensure we undertake a quality test with our crews.

### Boots

There a number of boots on the market for the rescuer and general Firefighting but I have recently come across these from HAIX with their latest creation, the Fire Eagle which has been developed for rescuers. It is a sleek and sporty functional boot, lightweight and flexible and equipped with all relevant safety features.

The most distinguishing feature of this boot is the two- colour toe-cap featuring signal yellow contour ripples. The two-colour design continues along the sole and aims at just one thing- maximum safety for firefighters during rescue work.

This boot has greater comfort and combines flexibility, minimum weight and protection features, the sole, toe cap and all other features of the boot have been adapted accordingly. The sole is exceptionally durable featuring fins combined with special grip elements and anti slip properties on wet ground and ice, mainly due to the two-compartment profile design.

The slight inclines in the toe and the heel area ensure smooth rolling over, while the movement sections are individually padded. These features provide the excellent comfort that is typically associated with sports shoes.

The Crosstech membrane technology from Gore® is breathable while keeping feet dry and protecting wearers against

▲ Far left – RBFRS Rescue team medic overalls and vest with speedings soft protection. Top – Soft protection sheet in use. Above – A selection of casualty and crew protection equipment carried on all RBFRS appliances.

blood and other body fluids. Thanks to the optimised two-zone lacing system, it takes less than ten seconds to put on and lace up the boot, perfect for the emergency situation firefighters will be in when they have to wear the boot.

### Patient PPE

Although not worn by rescuers, there are a few items of kit that must be used to improve patient comfort and safety. In my opinion, the patient sheet is a big deal and it should go over the patient as soon as is practically possible before work starts. In RBFRS we use one which has a clear vision panel in which will assist the patients welfare and also so that the rescuers can see them. We should also use Packexe to carry out glass management and I have discussed these techniques in previous articles. Finally as you cut you must provide sharps protection to protect everyone involved in the area and in RBFRS we use Speedings on all our appliances.



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# Fire and Rescue NSW

## – Planning for the Future

The delivery of Fire, Rescue and Hazmat services in today’s complex operating environment presents significant challenges for leaders within Emergency Services. Improving today’s operational performance in addition to planning for the challenges and changes of the future requires a high level of integration across functional units within an agency, as well as close collaboration with other organisations.



Paul McGuiggan

One Australian Emergency Service organisation has challenged and changed the way that they have previously developed operational capabilities and as such are improving operational service delivery and sustainability. Fire and Rescue NSW is the largest urban fire service in Australia and is responsible for preventing and responding to fire emergencies, providing direct protection to 90% of the State’s population in major cities, metropolitan areas and towns across regional NSW. They are the largest accredited rescue provider in NSW, as well

as being the combat agency for the State’s urban search and rescue capability. Fire and Rescue is the also the combat agency for hazardous material incidents and has capability to deal with chemical, biological and radiological hazards, including those resulting from acts of terrorism. In addition to these responsibilities, the agency supports the State Emergency Service during major storms and floods, and the Rural Fire Service during major bush fires. In some locations, they also assist the NSW Ambulance Service with medical first response.

Under Commissioner Greg Mullins leadership, Fire and Rescue has implemented an operational capability framework to improve its ability to better manage its service delivery

▼ NSW Firefighters removing debris and shoring up as they search the post explosion and fire debris in Sydney.



Image courtesy of USAR

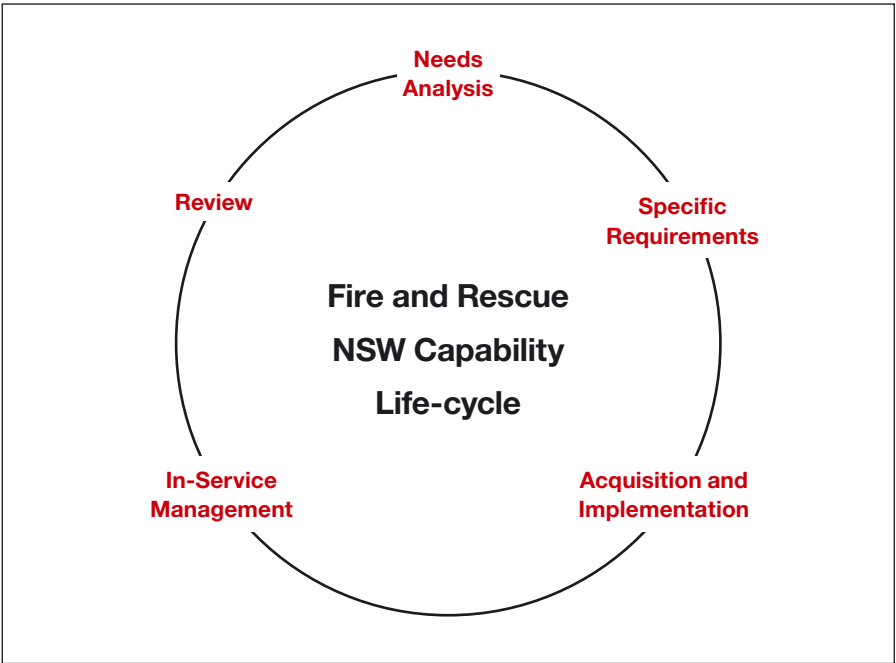
Chief Superintendent Paul McGuiggan is a 30-year veteran firefighter and currently Assistant Director of Capability Management for Fire and Rescue New South Wales (FRNSW). Chief Superintendent McGuiggan is a USAR IEC Team Leader and in 2011 deployed to Christchurch NZ as part of Australia’s USAR response to that earthquake disaster area. Recently Paul assisted the Swiss Government during the 2013 INSARAG earthquake response Simulation Exercise (SimEX) fulfilling the role of the UNDAC USAR Manager.

The development of Fire and Rescue’s operational capability framework was undertaken by Noetic Solutions and is based on work undertaken by the Australian military. In order to define these services, Noetic worked with Fire and Rescue to develop a taxonomy of its current operational capabilities, comprising high level capabilities such as Firefighting, Hazmat, Rescue, Incident Management.

Fire and Rescue has a long and proud history of providing rescue services to the community of NSW. From its early involvement at major rescues such as the 1977 Granville train disaster, 1997 Thredbo landslide, the day-to-day industrial and motor vehicle accidents, through to its International Urban Search and Rescue deployments, their rescue operators have been at the forefront of rescue in NSW as well as on the National and International scene.

To ensure the organisation remained a leading rescue service Commissioner Mullins instigated a Rescue Summit which brought together firefighters from all over NSW to evaluate their existing rescue capability. The Summit assisted Fire and Rescue to build a shared understanding of its role in rescue service delivery – and explored the current and future possibilities. It also identified key issues for rescue capability and a set of priorities to develop a roadmap into the future.

Throughout 2014 the Operational Capability Directorate within Fire and Rescue led extensive consultation with all Operational Commands and key Directorates to develop an integrated whole of agency plan for rescue capability over the next five years. For Fire and Rescue, operational capability is the ability to deliver their services within specified time frames and then sustain that service delivery for the time required – whether it is rapid response to a structure fire or working



alongside the Rural Fire Service or the State Emergency Service for many weeks during a campaign event.

Fire and Rescue Chief Superintendent Paul McGuiggan commented that, “an operational capability framework provides us with the means to more closely coordinate our operations and corporate support functions, the intention of the framework is to assist us to conceptualise, generate and manage capability in a more comprehensive way, and by under pinning the process with good project management, we hope to better sustain our operations and improve service delivery”.

The capability framework proposed for FRNSW comprises four elements:

- 1 A description of the seven inputs to capability; **P**ersonnel, **O**rganisation, **I**nformation, **S**upport, **T**raining, **E**quipment and **D**octrine grouped under the acronym **POiSTED**.

- 2 A capability taxonomy which provides a listing of all of the operational capabilities generated by FRNSW including their subordinate, or contributing, capabilities.
- 3 A Capability Lifecycle beginning with the identification of capability **Needs** and progressing through the definition of **Requirements**, the Acquisition of new capability or **Implementation** of changes to existing capability, the **Management** of the capability in-service and its eventual **Withdrawal** and Disposal.
- 4 A governance structure which aims to embed the needs of the capability lifecycle in Fire and Rescue’s decision making processes.

**POiSTED + Readiness + Sustainability = Fire and Rescue NSW Capability**

The POiSTED inputs to operational capability are tightly integrated. This means that, while each input may not

### FRNSW HAS A LONG ESTABLISHED HISTORY OF RESCUE CAPABILITY THESE ARE SOME EXAMPLES

1977	1997	1999	1999	1999	1999	2002
Grandville train disaster	Thredbo landslide	Sydney hail storm	Glenbrook train disaster	Turkey Earthquake	Taiwan earthquake	Lake Cargelligo water tower accident
2003	2004	2011	2011	2011	2014	
Waterfall train disaster	Indonesian Tsunami	Queensland floods	Christchurch earthquake	Japanese earthquake and tsunami	Bilgla sinkhole	



have the same importance in delivering an operational service, they must be considered and addressed. Some examples of the POiSTED inputs to specific operational capabilities are:

### Personnel

This input incorporates the recruitment, development and retention of people with the appropriate skills to deliver the services required. For firefighting, this includes the permanent and retained firefighters, as well as the trades and administrative officers required for the necessary support functions.

### Organisation

This input incorporates the command and management arrangements to ensure that our operational processes are effective and that performance is monitored and evaluated. For our capability to respond to a terrorist incident, this includes maintaining partnerships with the NSW Police Force, Ambulance Service and the Australian Defence Force.

### Information

This input incorporates information and communications technology, as well as the software and data that are used

as the basis of decision making. For incident management, this includes the computer aided dispatch system, geographic information system, mobile communications, as well as the outputs from operational debriefs.

### Support and facilities

This input incorporates the infrastructure and services that support operations for Fire and Rescue, including those administrative and corporate services associated with capability. For Hazmat service delivery, this includes our Hazmat technical servicing facility, as well as breathing apparatus servicing and cylinder filling stations.

### Training

This input incorporates the training required for each operational capability and the ongoing validation of training against operational performance to ensure that it continues to meet our needs. Training is closely related to Personnel, Organisation and Doctrine. For rescue in NSW, this includes the public safety competencies established by the State Rescue Board.

### Equipment

This input incorporates major plant and equipment, including pumpers, aerial, rescue and Hazmat vehicles. It also includes the acquisition and safe use of equipment required for specific capabilities e.g. personal protective clothing for structural firefighting, decontamination equipment for Hazmat, and hydraulic equipment for rescue operations.

### Doctrine

Doctrine is defined as “collective knowledge that has been structured and systematised to facilitate its application in practice and prepared for dissemination in a way appropriate for its intended audience” (AFAC, 2011, p. 2). It will enhance the effectiveness of operations through standardisation, provides a shared view of capability and is also the foundation of effective training. For Fire and Rescue, doctrine includes operational policy and procedures such as Standard Operational Guidelines and Recommended Practices.

▼ NSW Firefighters working with engineers and heavy plant to stabilise adjoining structures.



Image courtesy of USAR



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FIRE AND RESCUE NSW CURRENT RESCUE CAPABILITY LEVELS

1 Rescue Operations	2 Rescue Operations	3 Rescue Technical	4 USAR Dom and International
Location 337 Appliances 547 People 7200+	Location 76 Appliances 106 People 1310+	Location 19 Appliances 34 People 380+	Location 3 Appliances 5 People 160+
<ul style="list-style-type: none"> <li>■ All FRNSW firefighters are Level 1 rescue operators.</li> <li>■ They receive recognised rescue training enabling competence in core rescue services as rescue operators.</li> <li>■ They receive Basic Life Support training and provide initial rescue services across all FRNSW Fire Districts including road crash rescue.</li> <li>■ Attain selected rescue units of competency in accordance with the Australian qualifications Framework.</li> </ul>	<ul style="list-style-type: none"> <li>■ FRNSW firefighters who are attached to primary rescue units are endorsed by the NSW State Rescue Board (SRB) as General Land Rescue (GLR) operators.</li> <li>■ Have received recognised rescue units of competency in accordance with the SRB policy and are known within FRNSW as GRL rescue operators.</li> <li>■ Have legislative responsibility for rescue operations within geographical areas as specified by the SRB.</li> <li>■ Provide rescue support to level 1 rescue operators in both preparedness and emergency response</li> </ul>	<ul style="list-style-type: none"> <li>■ FRNSW firefighters attached to GLR units that can also provide other specialist rescue services such as USAR, vertical rescue, confined space and/or swift water rescue etc</li> <li>■ Have proven rescue experience and provide rescue support to level 2 GLR operators and level 1 rescue operators in both rescue preparedness and emergency response.</li> <li>■ Have increased rescue equipment, training and overall rescue capacity.</li> </ul>	<ul style="list-style-type: none"> <li>■ Level 4 USAR technicians can respond internationally and are endorsed by the United Nations.</li> <li>■ Have extensive rescue experience and provide rescue support to Level 3 rescue technicians and level 2 GLR operators in both rescue preparedness and emergency response.</li> <li>■ Have capability that includes substantial rescue equipment usage, training and overall rescue capability.</li> <li>■ Provide support to other accredited NSW emergency services accredited by the SRB.</li> </ul>



◀ NSW USAR firefighters search small voids for any signs of life.

The implementation of an operational capability framework, with the appointment of a dedicated capability management branch, represents a significant change in the way that Fire and Rescue NSW will develop and manage operations. There is still a large amount of work to be done, but with the finalisation of Fire and Rescue's Rescue roadmap the organisations executive is confident that they have the building blocks of our new operational capability framework in place.

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➔ For more information, go to [www.fire.nsw.gov.au](http://www.fire.nsw.gov.au)

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# New Zealand USAR advances their technology capability

The USAR capability in New Zealand falls on the shoulders of the New Zealand Fire Service. Their taskforce has a pool of 210 people sourced primarily from NZFS personnel both career and volunteers. The early days of USAR back in the 1990's was a very different picture from what it is today.



**Gavin Travers**

Gavin Travers is the National Operations Advisor (USAR) this role includes being the National USAR Manager based at National Headquarters in Wellington. He is a 32 year veteran firefighter and has progressed through the ranks to Area Commander.

**U**rban search and rescue was created by a small group of enthusiastic people who had the foresight of a USAR capability in NZ. They begged, stole and borrowed equipment including personal protective clothing to form the capability they strongly believed was needed for NZ.

On the 8th March 2015 New Zealand USAR underwent their INSARAG external classification in a bid to be classified as a "Heavy" team. They successfully achieved this after two and a half years of preparation and a significant financial cost and resource commitment. The Taskforce now known as NZL 1 were thrilled to receive 129 green and 7 yellow lights. The build-up was run with three work-streams

▼ New Zealand made, robust and portable it's a 'Solution in a box'.



running simultaneously and their associated project plans and cost allocations.

USAR Management Team – A new structure was introduced to provide a connection between the management of the team and the team members. The CAT3 component is all NZFS commanders who bring to the USAR command function a long and distinguished incident command level of experience. They lead the functional work-streams to provide governance and enabling to those work-streams.

Functional Work-streams – Membership is encouraged from each of the three geographically located teams. The work-stream provides a National and therefore consistent direction for the various functions within USAR. Equipment purchasing had been a problem area for us prior to the establishment of the work-streams.

After the Christchurch earthquake in Feb 2011 several independent reviews

► Progressing from 'pencils and notebooks' to electronic records.

made recommendations for a new management structure. This also involved the introduction of the NZFS ranks into the USAR organisation structure. A National USAR Manager was appointed to provide direction domestically, engage with other domestic emergency response partners and to promote NZ USAR at a political and international level.

Information and Communications technologies are a rapidly changing environment and NZ USAR wanted to ensure they not only introduced a new electronic method of data collection and in a collaborative space to share that data but developed this on a platform the rest of the NZFS could consume.

The result was the following...

In 2014, the NZ Fire Service established a technology solution to support Rapid Disaster Assessment by the NZ Urban Search and Rescue (USAR) task force, also supporting NZ USAR External Classification as an International USAR Task Force [Heavy] under the United Nations International Search and Rescue Advisory Group (INSARAG) framework in March 2015. The solution is built on the NZFS ESRI enterprise technology platform and supports NZ USAR Domestic and International deployments effectively through incident ground data collection and resource tracking (using tablets and ESRI Collector for ArcGIS software), real-time situation awareness in the USAR Base of Operations and Coordination Centres to support Incident Controller and Task Force leader decisions (using ESRI Operations Dashboard software), and provision of near real-time intelligence to other agencies globally through Cloud-based data storage and delivery (ESRI ArcGIS Online). The solution meets the operational protocols, forms and workflows defined by the United Nations and INSARAG and are also being deployed to Civil Defence and Emergency Management groups throughout New Zealand to support the Ministry of Civil Defence and Emergency Management (MCDEM) requirements for a Rapid Impact Assessment solution.

The practicalities of this is a Samsung Galaxy Note 10.4 tablet with 3G and Wifi options for connection



directly with the cloud or with another new ICT component also developed by NZ USAR. The deployment case boosts the following features;

- 4 x Bearer source, BGAN, Wireless, WAN, 4G
- USB 2.0 and 3.0 ports
- 6 Port Ethernet with POE
- 2 x 1GB HDD in raid configuration
- 1 x USB External HDD for backup
- OS Windows server 2012
- UPS which allows 30 mins operation at full load

- External power source from a car battery, 110-240V supply
- Mouse, Keyboard and USB screen inside the lid
- Router with load balancing and priority between bearers
- The inside of the case is painted with RF resistant paint.

▼ For more information, go to [www.fire.org.nz](http://www.fire.org.nz)

▼ The built in screen provides access to system status and settings.





# Ergonomic personal protective equipment design saves lives

From turnout gear, helmet, gloves and boots, to self-contained breathing apparatus, Personal Protective Equipment (PPE) is designed to protect firefighters from the multiple hazards they face. In such a physical profession, where firefighters must work in bursts of intensive physical activity, how is PPE designed to ensure that they are not overloaded with the weight of the gear, or subjected to additional heat stress? The answer lies in ergonomic design.



**Dr Richard Graveling**



**Janette Edmonds**

Dr Richard Graveling is Principal Ergonomist at the Institute of Occupational Medicine (IOM).

Janette Edmonds is Director/Principal Consultant Ergonomist at The Keil Centre.

Richard and Janette are both members of the Chartered Institute of Ergonomics and Human Factors (CIEHF).

**P**ut simply, ergonomics is the study of the work you do, the environment you work in, and the tools you use to do your job. “The goal of PPE design ergonomics is to design personal protection that fits you and the job you are doing” says Dr Richard Graveling, Principal Ergonomist at the Institute of Occupational Medicine (IOM).

2016 is an exciting year for the ergonomics profession. In recognition of the vital role ergonomics plays in the design of PPE, a new “Ergonomics design and evaluation of integrated PPE

systems” working group met for the first time last October. Formed by the European Committee for Standardization (CEN), the working group has been set up to represent PPE in all sectors on a European level and will report throughout 2016 on progress.

Applying ergonomics principles to PPE design helps to ensure that it fits properly and doesn’t interfere with work activities. Graveling cites the tragic case of a female police officer, stabbed to death after removing her stab-proof vest because it was getting in the way when she was trying to force entry to a property as part of a raid. “This case highlights the importance of getting it right – and the potential cost of getting it wrong. Studies have shown that PPE which doesn’t fit properly or gets in

▼ Locking in too much body heat can cause ‘boil in the bag syndrome’.



the way (including clashing with other PPE) is less likely to be worn” he adds.

Janette Edmonds, Principal Consultant Ergonomist at The Keil Centre draws upon her experience designing body armour for the police. “Core ergonomics design principles are based on scientific research in biomechanics, physiology, anthropometry and cognitive psychology” she says. “The issues range from the most efficient and least harmful places on the body to carry loads, to the areas of the body where the skin is least sensitive to compression, and even which way a fastener should fasten” she adds.

## Physical effects of PPE on the body

The work of Graveling’s IOM colleagues led by Joanne Crawford revealed that by wearing fire kit, a firefighter’s energy cost of simply moving around increased by 10 to 15 percent. Edmonds echoes this, citing physiological workload, muscular fatigue and strain and the potential for heat stress as key physical effects of wearing firefighter PPE.

Edmonds: “The addition of PPE typically increases the physical workload, biomechanical strain and thermoregulatory requirement on a firefighter’s body. For

example, we know that load carriage on the extremities, such as the feet, legs, arms requires more energy, than say load carriage on the hips. So, heavy footwear will require the body to work harder. The work of ergonomists has led to new designs which transfer load to the hips to decrease the strain” she adds.

Firefighters are regularly subjected to intense heat and physical exertion. PPE gear can exacerbate this, adding to the thermal burden. “Fire kit is very good at stopping heat getting in but also stops the heat the firefighter generates from getting out” says Graveling. One of the key findings of the research he and his colleagues conducted at the IOM raised the potential issue of overprotection. “When testing firefighters, we had them stand in front of large heat lamps simulating the heat load if they were working on a grass fire. The body was well protected inside – so much so that the outside of their garments became hot enough to burn your hand when you touched it, but the firefighter was alright. However, the physical effort meant that the firefighter gradually heated up inside”. The series of studies carried out for the Home Office at that time demonstrated that there was a risk that, in seeking to provide the

▲ A firefighter’s energy usage increases by up to 15 percent when wearing fire kit.

firefighter with more and more protection from the fire, there was a risk of locking in too much body heat (firefighters called this the ‘boil in the bag syndrome’).

One of Graveling’s and his colleagues other projects looked at fire hoods – the balaclava style fabric garment worn to protect the head. Interestingly, heat stress in firefighters wearing the hoods, was not significantly different to those who did not – despite concerns that, as a major avenue for heat loss, covering the head would have an adverse effect. One of the issues raised however, was a resistance from firefighters to cover their ears as many regarded them as heat sensors – when your ears start to burn, get out! Firefighters also raised the concern that their hearing might be impaired, making it harder for them to locate the source of sounds. However, testing revealed that the fire hoods had no significant impact on the firefighters’ sound location. Through this research two human factors issues were addressed and, partly as a result of this work, firefighters are now routinely supplied with fire hoods.





Image courtesy of British Uniforms

### An ageing society

In the UK today, almost a quarter (23%) of workers are 60 years plus, with this figure set to rise to a third (30.7%) by 2020. In the firefighting industry, does our ageing population bear any significance on PPE design?

In Edmonds' view, the issue is not just about age; it is about the health and fitness of the firefighter. "If a firefighter has a Body Mass Index (BMI) greater than 25, they would be classified as overweight or obese" says Edmonds. This is challenging when developing the size ranges and material shaping profiles of the garments. Graveling agrees: "It's a distinction between biological age, chronological age and behavioural age" he says. "There are a lot of older firefighters out there who are perfectly fit and capable and would meet existing fitness standards, however, there are also others where age is catching up with them, and the difficulty is, having a set retirement age is a one size fits all" he adds.

In terms of fitness, a firefighter's body needs to be capable of carrying the additional load. "A disproportionate body profile if you're out of shape, can

lead to adverse biomechanical load and strain on the muscles and skeletal system that the design was aiming to reduce" says Edmonds.

Taking a police and security perspective, Edmonds expresses the necessity of providing adequate protection where body armour plates overlap. If someone is overweight, ensuring the proper fit poses more of a challenge. If there are gaps, say, at the sides or the abdomen, this could lead to exposure of the body and vulnerability to stabbing or gunshot wound in the case of the protective vests.

This was recognised by the development of a British Standard (BS 8469) on the ergonomics of PPE for firefighters (also written with IOM support), which examines many issues including maintaining protection in different postures.

PPE can only do its job if it is worn, fits correctly, and is fitted properly. Designing, procuring, providing and wearing PPE which has been ergonomically designed to meet the specific needs of workers is vital and helps to ensure that those workers go home uninjured and healthy at the end of the day.

▲ PPE can only do its job if it fits properly and is worn correctly.

### Case Study

When London Fire Brigade needed to select new fire kit, they recognised that ergonomics characteristics were a fundamental feature of such kit. So they decided to include ergonomics testing of the fire kit on offer as part of the selection process. Supported by IOM ergonomists, a volunteer sample of London's firefighters carried out a series of standard tests, based on BS 8469. Graveling: "Tests covered the fit of the PPE – including when bending and stretching – and the impact of the PPE on a selection of firefighting-related tasks such as rolling out hoses and raising ladders. The results formed a major component of the selection scoring and helped to ensure that the capital's 5,000 firefighters were equipped with ergonomically the best fire kit on offer" he explains.

➔ For more information, go to [www.ergonomics.org.uk](http://www.ergonomics.org.uk)



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# When seconds count: Disaster relief using augmented reality

On Saturday, March 22, 2014, at 10:37 a.m. local time, a major mudslide occurred 4 miles east of Oso, Washington in the North Western United States. The mudslide covered over 2.5 Km<sup>2</sup>, buried 44 properties. More than 176 people were initially reported missing.



**Erin Murphy**

**T**hat morning, the Snohomish County Sheriff's Helicopter Rescue Team was ready to launch on a training mission in their Bell UH-1H "SnoHawk 10" when the request came to survey an area where a mudslide was reported. The magnitude of the situation was not initially known, but once the aircrew arrived on scene and grasped the immensity of the situation, additional rescue and aviation resources were called in. The aircrew immediately started conducting life-saving hoist rescue missions together with the first responding Fire agencies from Oso and Darrington. U.S. Navy Whidbey Search and Rescue arrived with their Sikorsky MH-60 and

assisted in conducting hoist rescues. Eight lives were saved that day due to the quick response and combined efforts of these agencies.

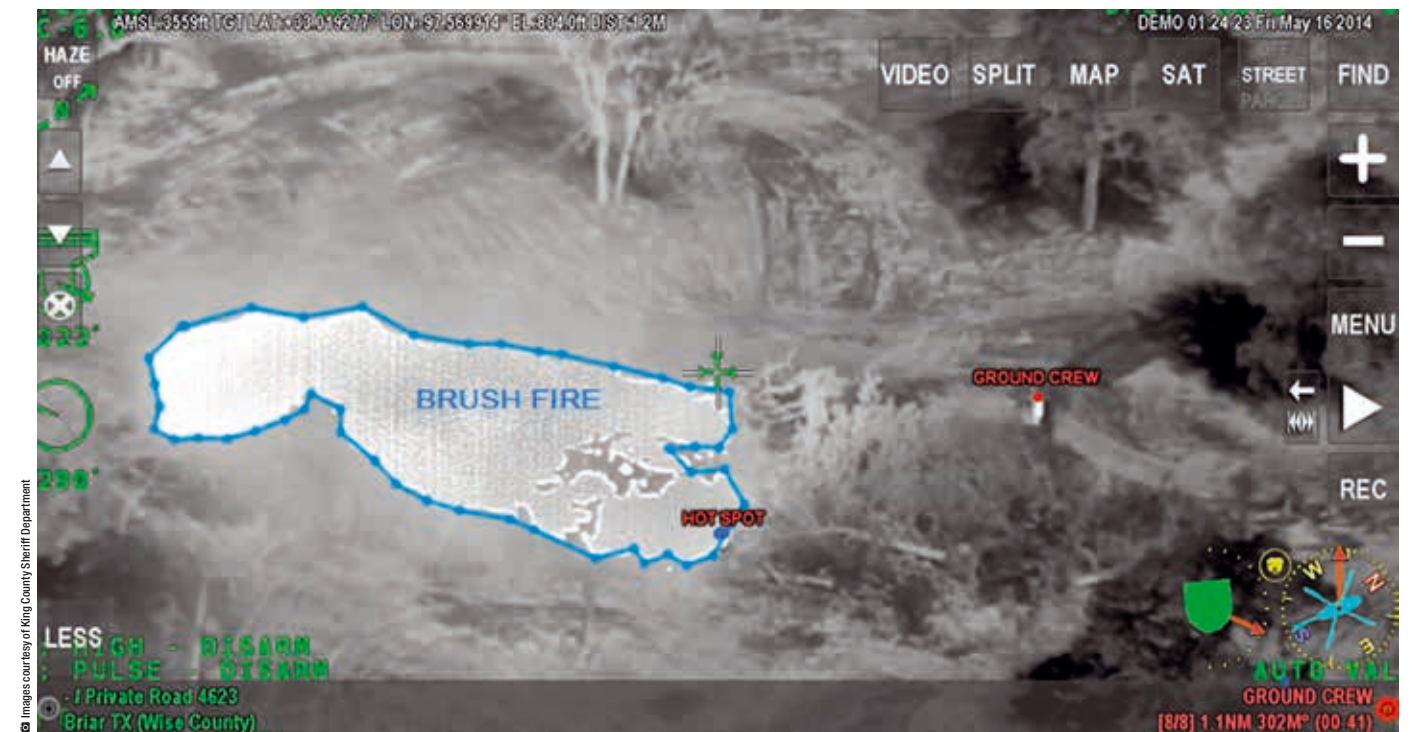
The responding aircraft, equipped with stabilized infrared imaging cameras and the latest augmented reality mapping systems were launched to be the "eyes in the sky" adding to the safety of the first responders and communicating valuable information about the scene to the crews on the ground. These air assets were able to provide a uniquely valuable perspective. The information that was able to be shared with the ground crews, decision makers and first responders utilized the latest technology that allowed the flight officers to toggle between live video and the pre-disaster aerial photography for a "before and after" view of the area.

▼ Churchill Navigation Airborne Augmented Reality System.



Augmented Reality is a technology that superimposes a computer-generated image on a user's view of the real world, or the integration of digital information with live video in real time.

Erin Murphy is Director of Sales for Churchill Navigation.



▲ Display of Fire perimeters, hotspots and ground crew locations over live video.

This augmented reality technology also provided the aircrew the capability to display critical information including addresses, property boundaries and owner names of the homes affected by the disaster, overlaid on top of the live video. The aircrews were able to respond quickly to direct air and ground rescue efforts into the most devastated and populated areas.

Snohomish County Chief Pilot Bill Quistorf, recalls how the Augmented Reality technology aided them that morning, "During our first search pattern Deputy Espeland exclaimed "There were 40 homes out here!" "40 homes where?" I asked him. "Right here!" he answered and pointed to the gravel and mud below us. I then looked over at the ARS monitor and saw that we were flying directly over Steelhead Haven, a residential area that had contained a series of streets and over 40 homes. The Churchill ARS allowed us to verify that we were directly over the top of the small development. I hovered two to three feet above the debris field so we could conduct a detailed visual search and detailed thermal search of the residential area. "We did not locate

any additional survivors in the main debris field, but due to the real-time moving map and map overlay features of the Churchill ARS, I was confident that we had searched the area with 100% search coverage. The ARS also allowed us to visually compare the historic satellite image of Steelhead Haven with the physical destruction that we were witnessed and then realize the totality of that destruction."

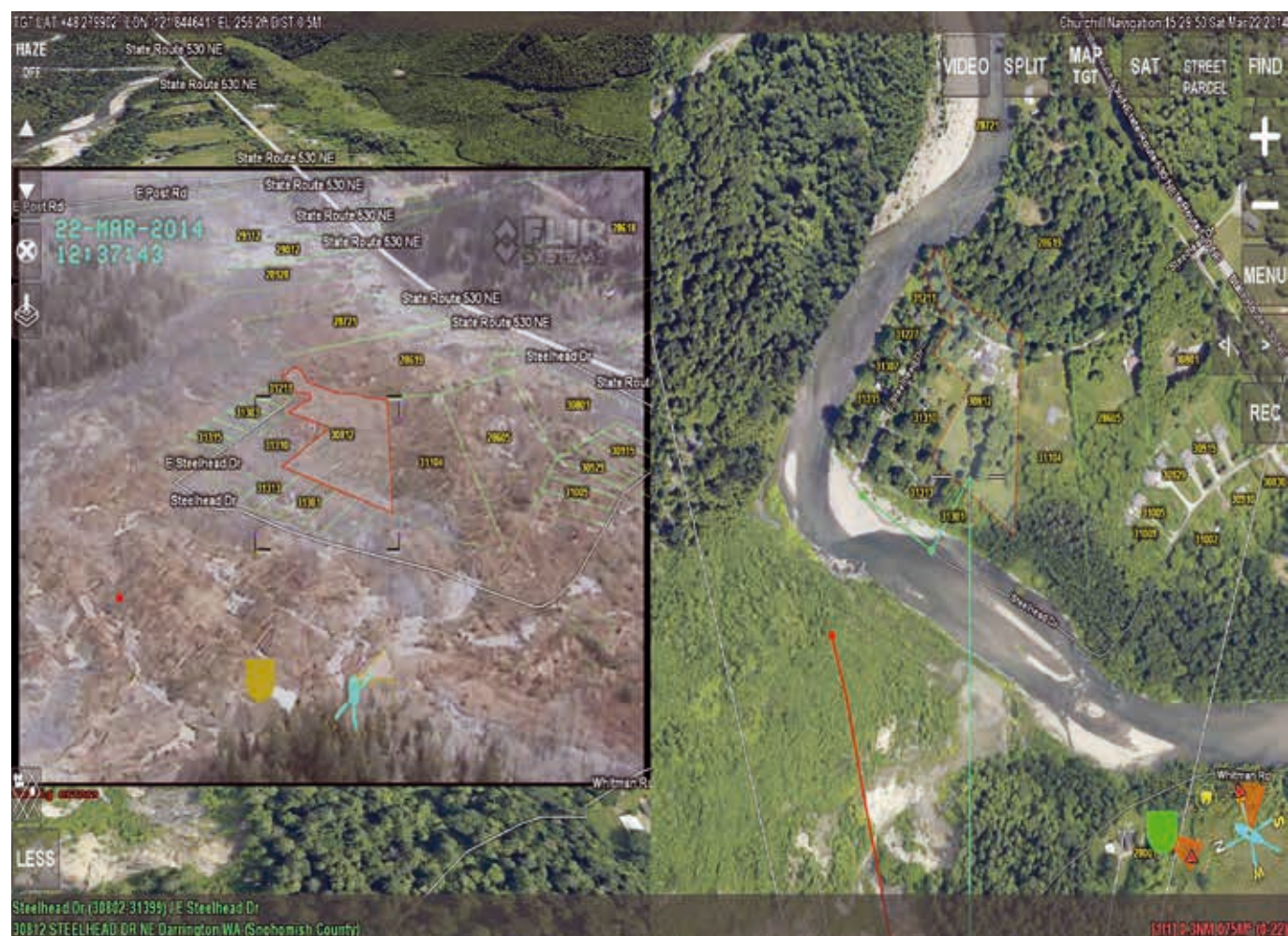
This Augmented Reality technology has proven to be an invaluable tool to first responders, supporting the expanded role of search and rescue, medical aid, and fire management missions.

Core capabilities such as the display of GIS information to include: addresses,

▼ Overlay of house addresses and parcel information over the Oso Mudslide disaster area.







street names, businesses and hiking trails on top of the live EO/IR video gives the operator a clear picture of exactly where the camera is looking. This overlay view saves the crew from the struggle of correlating between multiple displays or having to fumble with map books for identifying locations. It provides immediate familiarity with the area and ability to share this information with those in need on the ground.

The synthetic imagery layer, comprised of 3D high resolution, color satellite imagery is linked to the camera view. It can be used to compare a color image of the area if viewing the video in IR or at night, to gather information about the target area prior to it being in view by the camera, to extend the field-of-view, or as used by the first responders in the OSO mudslide disaster, to show a before and after comparison of the disaster area.

Search patterns can be calculated and displayed on-screen and the camera can be set to automatically follow the line of the pattern at a designated speed. Perimeters can be drawn around fires or areas of interest and locations can be

marked and saved. To aid in reporting and information sharing, this information is easily exportable to Google Earth or ESRI Explorer type programs.

The airborne augmented reality system also adds mission management capability, interfacing and controlling a wide range of external equipment including steering the camera and searchlight, commanding the controls for the downlink and interfacing to a wide range of RADAR type targets. Targets such as emergency vehicles (AVL), boat locations (AIS), air traffic (TCAS or ADS-B) and even cell phone locations (when logged into a server) can be displayed over real-time video in the aircraft for up to the minute display on pertinent information and locations.

As other technologies are added to the platform these can also be integrated, bringing a heightened level of situational awareness. One such example is the integration of a Mobile Ad-Hoc Mesh network. These radios, which transmit voice similar to a traditional Motorola, are capable of self-forming networks which relay voice and data through intermediary radios. The ad-hoc mesh network can

▲ Before and After – using synthetic imagery in the Oso mudslide.

be used to transmit video to the ground, similar to a downlink system. Moreover, the radios can broadcast their GPS location (which some Motorola radios can do as well). The location signal can be integrated into the Augmented Reality mapping system on the aircraft, displaying an icon representing the firefighter or ground personnel over the live video from the gimbal in the aircraft – either in the air, or back on the ground (to the firefighters themselves, over the same mesh network, or at a command station). This not only gives the air crew the ability to easily direct the rescue forces to the most necessary areas, but provides the added and much needed capability to know the exact location of the ground teams and to keep them out of harm's way, adding to the safety of our ground forces and decreasing the loss of life.

➔ For more information, go to [www.churchillnavigation.com](http://www.churchillnavigation.com)

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# The case for training all responders in preservation of evidence

It is a rare firefighter who, in the excitement of a fire event, thinks of a fire scene as a place filled with valuable forensic evidence. Although we may think of the fire itself as the reason evidence is destroyed or compromised, the activities of firefighters and first responders can be just as damaging to physical evidence. Unnecessary evidence alteration or destruction can impair the ability of governments and others to determine the origin and cause of fires and to resolve the legal proceedings and disputes that result. In extreme cases, it can expose the agency to criticism, negative publicity, and potential legal action.



**George A. Coddling**

George A. Coddling volunteers as a firefighter and fire investigator for a fire department in Colorado, U.S.A., and works as a prosecuting attorney for the state government. He has served as chair of a multi-agency investigation team. He is a member of the International Association of Arson Investigators (IAAI), where he has served as a committee chair, text reviewer, chapter president, and director. He is currently First Vice-President of the IAAI, and will become President in April, 2016. He has a Juris Doctor law degree, and holds the IAAI's Certified Fire Investigator (CFI) certification. He has published several articles on legal and investigation topics, and has presented on legal, methodology, and investigation subjects in English, French, Spanish, and Portuguese.

**M**ost fire safety professionals know that the causes of fire must be understood so the public can be educated how to prevent future incidents, and so safe and reliable products can be designed and sold. Understanding what causes fires depends on good fire investigation, which includes a thorough

▼ The hard work and conditions of firefighting mean that evidence can and often is inadvertently compromised by firefighters.

analysis of all of the physical evidence at a fire scene.

Every fire investigator from any agency or business should receive training in identification and preservation of evidence, whether or not the investigator's duties include evidence handling. Just as important, firefighters and first responders to a fire scene should also be trained on actions they can take to avoid compromising the evidence that is needed to make a just, accurate determination of the cause of a fire.



Image courtesy of George A. Coddling

## Firefighters and First Responders

Fire scenes are often attended by first responders other than the fire department, including industrial fire brigades, police, private security, and military. It is easy to picture the ways in which a first responder could innocently compromise physical evidence. Firefighters and hoses move freely through burnt and unburnt areas of a scene. Personnel enter scenes with tools that run on petroleum products like gasoline, potentially transmitting those products to fire debris. People walk through fire scenes out of interest and curiosity, bringing potential contaminants in on their shoes and clothing.

Training for these responders can be provided by the agencies responsible for the investigations in their jurisdictions. It should include the importance of fire evidence in the legal system, recognizing items that might constitute physical evidence, ways to mark and report locations of evidence, and the ways in which contaminated clothing, footwear, and equipment (as well as the activities of ordinary firefighting) might compromise fire evidence.

Understanding that suppression and overhaul activities are necessary in a fire scene, firefighters should follow the following guidelines to assure that they do not contribute unnecessarily to compromise of evidence:

- Recognize that physical evidence may exist anywhere in a fire scene, whether or not the area in question has been affected by fire. Take efforts to not disturb or move property, turn switches and knobs, or examine objects or appliances without good reason. Things that do not seem like they should be evidence could nevertheless be important to the investigation.
- When possible, extinguish fire with minimally necessary amounts of water, and restrict the search for fire extension ("overhaul") to only those activities needed to assure that the fire has been located and extinguished. Avoid the temptation to remove property or otherwise clear the scene or the fire room without approval from the investigator.
- When electrical circuit protection must be turned off to protect people or property, do so in a way that preserves branch circuit protection for inspection by investigators. For example, circuit breaker panels often have "main"



Images courtesy of George A. Coddling

▲ Electrical evidence is often fragile and should not be disturbed unless necessary for fire suppression.

► Evidence markers in a fire scene.



breakers that control all of the circuits in the panel. Switching the main breaker off allows the branch circuit breakers to remain in the position they occupied before the arrival of responders, affording valuable information to the investigator. If possible, prevent utility personnel from removing parts of the system, such as gas appliances and meters, until they are inspected by investigators.

- Take extra care to not bring petroleum products such as gasoline (petrol) into the scene. Refuel tools away from the fire area, and if possible, avoid using power tools in the heaviest areas of fire damage. Heavy motorized equipment should not be used on a fire scene without prior consultation with the investigator.
- Restrict personnel who enter the scene to those whose presence is necessary to accomplish suppression of fire. Department personnel can be posted at entries and exits to keep track of who has been in the fire area.

- Protect items that appear to be potential evidence by marking their location, diverting personnel away from them, and bringing them to the attention of commanders and investigators.
- When possible, maintain walking pathways through fire scenes. This permits personnel to work within a scene while preserving most areas from being compromised by travel. Similarly, pay attention to where hoses are moving, and take efforts to prevent hose streams, as well as the hoses themselves, from doing unnecessary damage.

The International Association of Arson Investigators (IAAI) encourages the training of firefighters and first responders in preservation of evidence. The organization, composed of 8,300 public and private investigators, engineers, scientists, and insurance personnel from 66 countries who are involved in the investigation of



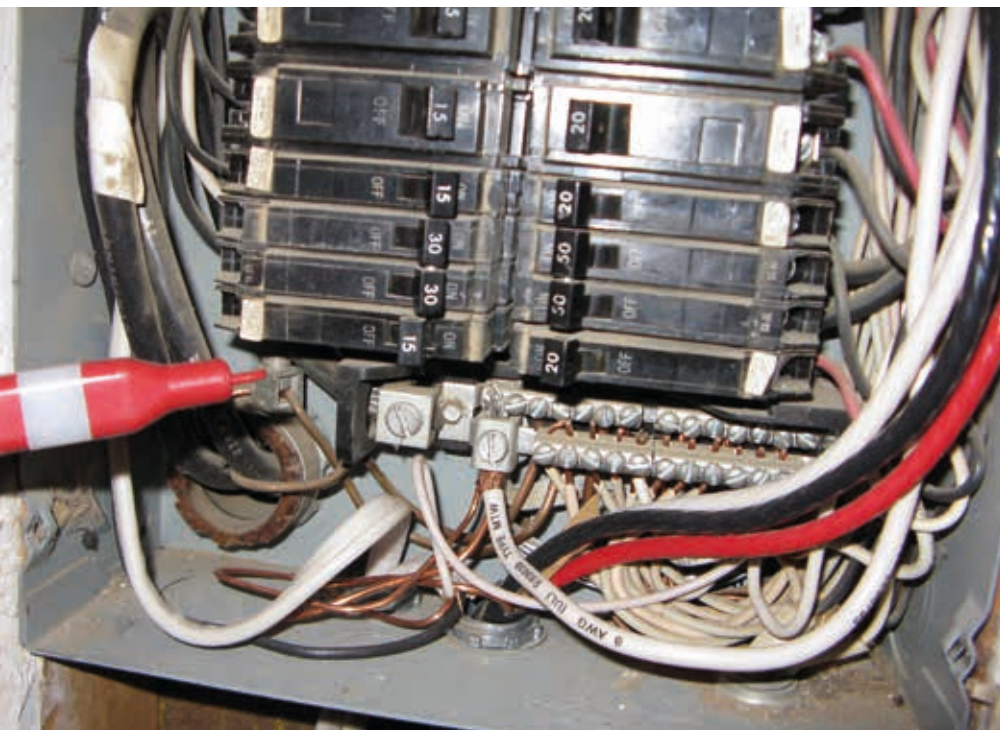


Image courtesy of George A. Coddling

▲ If circuits can be made safe without disturbing branch circuit breakers, valuable information remains for the use of fire investigators.

all types of fires, has published a video that describes steps that can be taken by firefighters and first responders to help preserve fire evidence for later investigation and inquiry. The video is accessible on line at: <https://www.firearson.com/Publications-Resources/First-Responders-DVD.aspx>

### Investigators

Depending on the jurisdiction, public authorities may or may not be involved in the investigation of a given fire. Many fires are investigated by privately employed investigators or engineers. Some investigators handle and collect evidence, while others are obliged to alert police services for handling. In yet others, the close examination or forensic testing of physical evidence may not occur unless there is a legal process or insurance dispute, necessitating the involvement of privately employed investigators.

Investigators without the proper training are at great risk of compromising the evidence physically, and/or of being unable to demonstrate that it remained intact up until the time of testing or presentation in court. For example, trouble can arise if an investigator uses unclean tools or containers to collect fire debris; uses a container that is not appropriate for the type of evidence

involved; disconnects electrical evidence at an incorrect point in the circuit; fails to use new gloves and clean tools for each collection of debris; allows his or her DNA to mix with samples being collected; inadequately documents the chain of custody of a piece of evidence; or stores and transfers evidence inappropriately.

The U.S.A.-based National Fire Protection Association (NFPA) promulgates consensus-based standards and codes relating to fire and life safety that are recognized and followed in many parts of the world. NFPA 1033, Standard for Professional Qualifications for Fire Investigator, addresses the expectations for fire investigators in all sectors of the industry as to the preservation and collection of evidence with several job performance standards.

All agencies and businesses employing fire investigators should provide and encourage training that follows the roadmap provided by NFPA 1033. Credentials and certifications for fire investigators should include testing on evidence topics. The credentials offered by the IAAI are becoming widely recognized in the world, and are based on the standards of NFPA 1033 and the prominent investigation guide, NFPA 921. These credentials include testing on evidence topics.

One IAAI credential, Evidence Collection Technician (ECT), includes a practical test in which the candidate collects and packages a variety of types of evidence

(such as ignitable liquids and fire debris) with a proctor who uses a procedural checklist to verify that the candidate has successfully performed the requisite elements of safety, skill, contamination prevention, and chain-of-custody documentation. The candidate who passes the ECT comes away with a credential that attests unequivocally to his or her evidence collection and preservation skills.

Regardless of the source of the training, education of fire investigators should include at a minimum the following:

- Decision making as to whether evidence should be collected
- Appropriate tools for evidence collection
- Importance of cleanliness of tools and equipment
- Cleaning methods for tools and footwear
- Contribution of uniforms and boots to evidence compromise
- Collection methods for fire debris, fireworks and incendiary items, ignitable liquids, clothing, blood, DNA, toolmarks, electrical items, and other categories
- Appropriate containers for the different types of evidence, and the different types of tests that might be necessary
- Handling of electrical evidence
- Appropriate documentation of the evidence collection procedure
- Appropriate handling, storage, tracking, and transmittal of samples

Investigator training includes modules available on IAAI's free web training platform, [www.CFITrainer.net](http://www.CFITrainer.net).

### Conclusion

Public safety is enhanced when the causes of fire are determined, and proper fire investigation is the key to determining causes. When fire evidence is preserved, there is a far greater likelihood that a fire investigation will be successful, and that later governmental inquiries or legal proceedings will be well-informed. Agencies and businesses should assure that their personnel are well trained in identifying, preserving, and where appropriate, collecting and storing fire evidence. Such training is essential not only for investigators, but for all personnel who respond to fire incidents.

➔ For more information, go to [www.firearson.com](http://www.firearson.com) [www.cfitrainer.net](http://www.cfitrainer.net)

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### THE FLOATING WATER EDUCTOR

Use as a portable fire hydrant system. Requires as little as 3' of water such as rivers, creeks, ponds or swimming pools.



### THE WATER EDUCTOR

The Water Eductor can be used with or without float in rivers, creeks, ponds or swimming pools.



# Solar power: Enabling new capabilities for emergency services

September 12, 2015: Lake County, California. A fire starts and expands rapidly just north of the California wine country. It takes over 200 fire personnel and equipment to finally contain the fire. The aftermath: over 700 square kilometers burned. With over \$1.5 billion USD in economic losses, this fire is one of the costliest and largest in U.S. history. Four civilians dead and four firefighters seriously injured. Every year, over 100,000 wildfires occur in the U.S. and they can double in size every five minutes. For wildfires, just as with any emergency situation, early detection and quick response are key to containment.



**Rob Parenti**

Rob joined the product marketing and engineering team at Alta Devices in January 2015. His primary role is integrating Alta's solar technology into their customer's final products. Prior to joining Alta Devices, Rob served in the U.S. Air Force as an engineer primarily analyzing the feasibility of various next gen defense systems. Rob holds a M.S. in Materials Engineering from the University of Dayton and B.S. in Aeronautical and Aerospace Engineering from Purdue University.

## Solar Power To The Rescue

Although there are many tools currently available for early detection, it is hard to use these same tools in remote or very large areas where events like wildfires occur. Wildfires can be particularly difficult to predict because they can start anywhere at any time. However, if we could bring some of the tools currently available, like smoke sensors, and apply them to vast remote areas it could increase the likelihood of early detection. The biggest obstacle to deploying these tools is the

▼ Applying solar to existing platforms, such as the AV Puma UAV below, could assist in the early detection of wildfires.



ability to keep them powered. To power these tools, we need a power source that can last years with minimal to no maintenance. Batteries alone do not provide the answer and therefore we must turn to renewable energy sources. The most portable and reliable of these energy sources is solar.

## What Is Solar Power

Solar power is a generic term for any material that takes incoming light and converts the light into usable energy. More technically, this material is known as being photovoltaic. In 1954, Bell Labs invented the first practical solar cell using silicon as the photovoltaic

material. Silicon is still used in the majority of solar/photovoltaic cells and they are generally assembled into large panels on commercial and residential roof tops or are part of large installations on vast amounts of land. This ubiquitous solar technology generally supplements the electrical power grid. Traditional silicon-based solar is abundant and relatively inexpensive. However, it is bulky, heavy, and provides low to modest power output. In general, silicon-based solar is not practical to power remote tools, like the ones needed for early detection and quick response for emergency services.

## A New Type Of Solar Power

To power devices like small remote sensors or unmanned aircraft we need a solar power source that is small, lightweight, and has high power output. One of the best photovoltaic materials on Earth is gallium arsenide (GaAs). In 1970, the first GaAs solar cell was developed by Zhores Alferov in Russia. GaAs has some significant advantages over other materials: it is naturally inert and resilient in most environments and it has a very high power density (more power for the same surface area). GaAs superior performance was immediately evident, but the material had a significant drawback: cost. GaAs was 200 times more expensive to produce than silicon. Additionally, its traditional form is also bulky and heavy, like silicon-based solar. There are methods to decrease the weight of traditional GaAs, but these methods only increase the end product

cost. As a result, GaAs has been used almost exclusively in space over the last 45 years. Again, due to its high cost and weight, traditional GaAs is not practical for remote power. But what if there was a way to take all of the great advantages of GaAs and lose all of the disadvantages. Luckily, a solution like this already exists.

In the 1980s, renowned PhD physicist Eli Yablonovitch pioneered a technique to remove thin layers of GaAs from expensive GaAs wafers. By removing thin layers, the GaAs film retained all of the properties of traditional GaAs solar technologies, but the underlying wafer could be reused to save cost. The resulting films were extremely thin and flexible. Today, this process is known as epitaxial lift-off or ELO for short.

One of the companies currently taking advantage of the ELO process and manufacturing these thin film

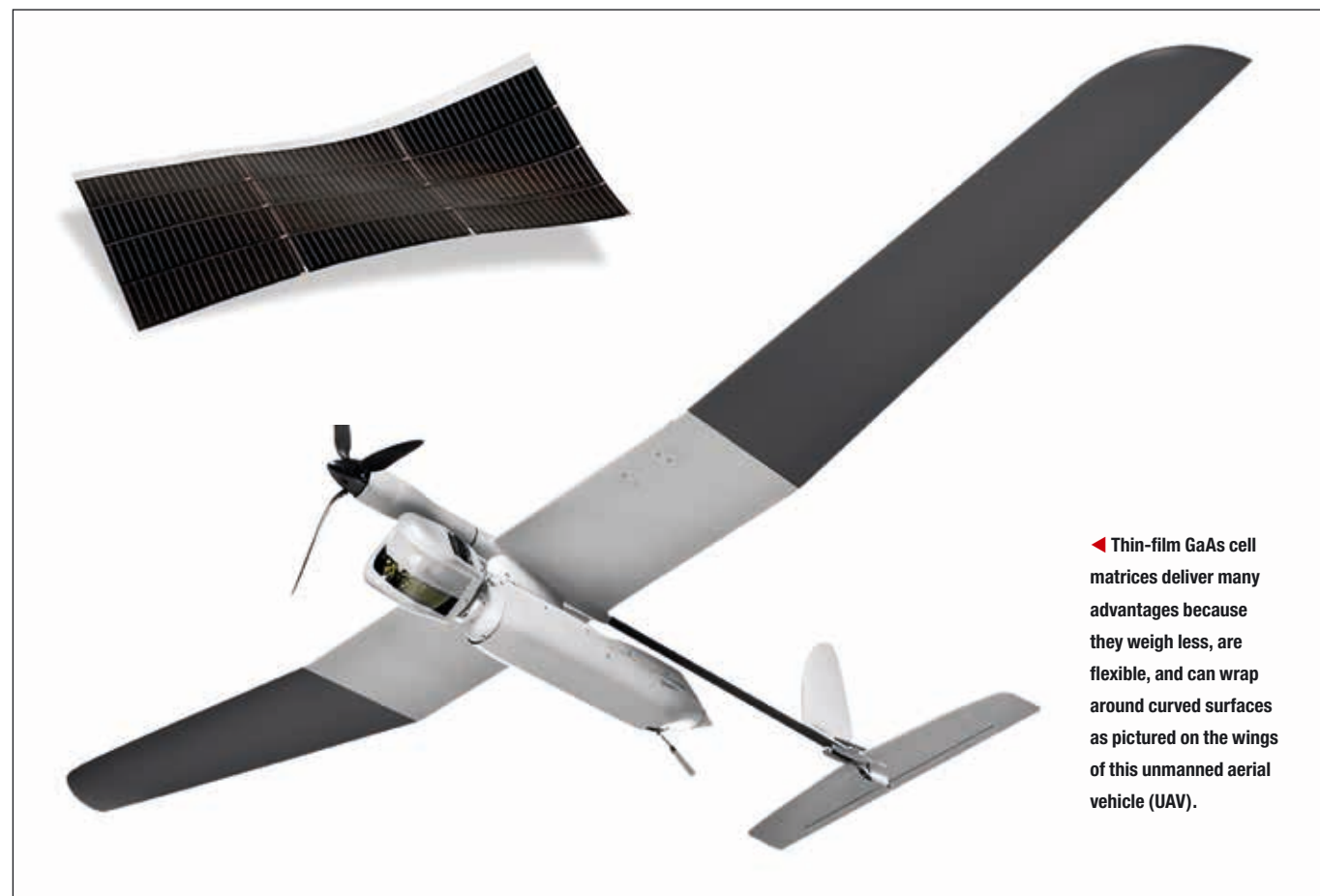
► While traditional solar technologies are rigid, new technologies can be thin, lightweight, and flexible making them ideal for a whole new range of applications.

▲ Aircraft like the AV Puma (pictured above) are easily deployable and can stay in the air all-day with the addition of solar power.

GaAs solar products is Alta Devices (co-founded by Yablonovitch) located in Sunnyvale, California. Gang He, Alta Devices CTO, gives his perspective about thin GaAs, "What makes this technology so special is that it combines the most efficient material for solar applications and puts it into a thin and lightweight form factor. This combination makes it ideally suited for a whole new class of applications that are not addressed by conventional solar technologies." Thin







◀ Thin-film GaAs cell matrices deliver many advantages because they weigh less, are flexible, and can wrap around curved surfaces as pictured on the wings of this unmanned aerial vehicle (UAV).

Image courtesy of Alta Devices

film GaAs solar can add significant value to existing products by increasing product operability lifetime. Solar can be retrofitted to existing optical, infrared, gas, and smoke sensors. This means that thousands of units of early detection equipment could be placed within disaster prone areas and left unattended.

### Combining New Solar Technology with New Tools

Thin film GaAs can also add value to new tools being developed for emergency services such as unmanned aircraft. In late 2014, NASA signed an agreement with the Department of the Interior's U.S. Fish and Wildlife Service to test small unmanned aircraft for the detection of brush and forest fires. Although results of the tests have not been published to date, the State of Virginia's Great Dismal Swamp Refuge manager Chris Lowie is hopeful, "...airborne unmanned platforms and their ability to offer a safer and more cost effective alternative for surveillance of potential areas of interest...as well as a reduction in time to detect nascent fires...could potentially save millions of dollars to the taxpayer..." The particular unmanned aircraft being developed

uses both visual and infrared cameras to detect fires. However, current flight times are limited to an hour which limits both the range and usability of the aircraft. If this aircraft utilized thin film GaAs solar on its wings, it could potentially quadruple the range making it a better fit for the large areas of land where wildfires normally start.

### Keeping Sensors Powered By The Sun

Another new technology that would benefit from the addition of thin film GaAs are wireless sensor networks (WSN). WSN are spatially distributed autonomous sensors that typically monitor environmental conditions. The individual sensors collect data and pass the information to a central hub where data from the sensor network is combined. This collective data is then used to create a depiction of the environment being monitored. The technology emphasizes low cost, power consumption, and promotes the use of solar to keep them powered. In other words, a network of sensors could be placed within fire prone areas to increase the chance for early detection. If the

fire grows, the network will be able to track its movement through the collection of environmental conditions. Finally, combining WSN devices with thin film GaAs solar cells allows them to be left unattended for extremely long periods of time without maintenance.

### Summary

Imagine if the emergency response team in Lake County, California had a network of remote firefighting tools at their disposal. Thousands of ground sensors capable of detecting environmental changes coupled with small unmanned aircraft patrolling the sky with optical and infrared cameras in search of flames. All enabled and powered by thin film GaAs solar cells. How much destruction could have been prevented through early detection and predictive fire mapping? While we cannot change the past, we are certainly entering an era where WSN and unmanned technologies are converging to provide emergency services with new tools to help fight remote events all powered and enabled thanks to thin film GaAs solar.

 For more information, go to [www.altadevices.com](http://www.altadevices.com)



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Weight	kg/m	1.1	1.6	2.8	4.0	4.8
Burst pressure	MPa	4.2	4.4	3.6	3.0	2.8
Maximum working pressure	MPa	1.6	1.6	1.4	1.4	1.4
Temperature range	°C	-20°C~50°C				



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# International fire fighting, becoming the 'norm'?

Dry winter conditions created a Canadian fire season which was dominated by an unusually large number of forest fires, some in Boreal Forests that typically don't burn. Area burnt by forest fires in the Northern hemisphere continue to set new records in the 21st century, and 2015 is likely to see this trend continue. As Canadian fire fighting resource became depleted the Canadian Interagency Forest Fire Centre (CIFFC) initiated a request for support from outside Canada.



**Ian Tanner**

On Monday 6th July 2015 David Nugent, Parks Victoria and Ian Tanner, Department of Environment Water and Natural Resources arrived in Winnipeg, Manitoba, Canada. Sent forward, with only a few days notice, to support arrangements between CIFFC and Emergency Management Victoria (EMV). This resulted in 47 Australian fire fighters being deployed into Alberta and 52 into British Columbia from Emergency Service Organisations around Australia. Support to Canada was also provided by the United States, New Zealand, South Africa and Mexico.

So why Australia? Australia is well

▼ Alistair Drayton Australian IC and Cameron Leary Australian Operations Section Chief are discussing control options with Dan Dykens, British Columbia Forest Service on the Cougar Creek Fire 247 in 2015.



Ian Tanner is a recognised leader and practitioner of fire management in South Australia. He has considerable fire management experience, and has been engaged as the Senior Regional Fire Management Officer for the Department of Environment Water and Natural Resources (DEWNR) since early 2004.

placed to assist with forest fires in Northern America. Incident management here is managed using the Australasian Inter-service Incident Management System (AIIMS) which is very similar to the Incident Command System (Canada) and the National Incident Management System (United States). Providing easily transferrable skills and knowledge between countries. For some the most difficult adjustment is which side of the road to drive on, and tipping!

There has been a long standing relationship with Canada and the US which was developed through the forest industry managing forest fires. Since the 1950's Forestry agencies have engaged each other through international study tours and exchanges. Today many forestry agencies in Australia are part of, or work very closely with, other land management agencies like Parks and Water Authorities. Together they are often referred to simply as the



▲ Australian Ignition Specialist (IGSP) Brett McNamara has some down time with the Canadian Aerial Ignition Crews at the China Knows Fire 116 in 2014.

"land managers". Across Australia these land managers and the other emergency service organisations have also evolved, they constantly improve in order to provide a more seamless and professional service to the community. We work as one under the principles of AIIMS to ensure that we are all providing best practice emergency management. Supporting Canada was no different as all Emergency Service Organisations (ESOs) around Australia worked to assemble a multi-agency team to fulfil the request.

## Logistics – unsung heroes

In 2015 there were two international deployments, both managed by Emergency Management Victoria (EMV), in liaison with ESO's from around the country. Many Australian fire fighters perhaps wrongly assume that all they need to do to assist another country is get on a plane and find out about some local practices. They may be surprised to learn about the significant amount of work that occurs in the background. This coordination role and the significant amount of work that is required generally goes without recognition.

Here is a small list of some of the many challenges that you may be presented with in order to fight fires another country;

- Suitability of personnel. Be appropriately trained and experienced and then, depending on the role meet fitness standards. In Northern America you will need to achieve an 'arduous' fitness classification to be allowed to work on the fire ground.
- Information needs to be gathered, prepared and provided to fire fighters before they leave home. Allowing them to prepare and pack the appropriate equipment. There are often weight and bag restrictions when working on fires in Canada and the US.
- Logistical considerations, How to get fire fighters from around Australia to the host country safely and in a timely manner. EMV were able to get over 100 people onto one flight from Australia to Vancouver in 3 days. A considerable achievement.
- Australian agencies, as employers, need to ensure that Occupational Health Safety and Welfare provisions have all been considered and met. Each agency will have slightly different processes that need to be accommodated, as will the host country. Safety will not be compromised.
- Immigration will need to be addressed. Often involving the US as they are a stopover to get to Canada.
- How to maintain communications with home. Particularly when fire crew are deployed into remote forest locations for up to 14 days. There may be long periods without the ability to talk to home.

Australian fire fighters will perform at their best if they are engaged in accordance with their competency, training and experience. Success and reputation relies on good communication between countries regarding the tasks to be undertake and the skills required. As fire fighters we understand the challenges that different topography, weather and fuel types present. Fighting fires in the forests of Northern America is unique and specialised work. They cut 'guard' (control lines) for kilometres and then run canvas hose from a lake, through pumps, to supply water for mopping up. Perhaps more akin to an irrigation system than a fire fighting operation. The Canadians use a lot of aircraft and availability of large volumes of water in relatively close proximity of fires is common. In order for these overseas missions to be successful fire fighters deployed need to be confident in their abilities, and adaptable to the new techniques that are employed.

## Development benefits

There are many benefits to individuals, organisations and the Australian community that come from international deployments. We learn new skills and test existing ones. Consider the importance of the interagency and interstate relationships developed between Australians while deployed. It is well understood that teams function more effectively if there are established relationships. Therefore these new relationships between Australian fire fighters is a massive benefit to Australian





Image courtesy of Ian Tanner

communities when these professionals come together during times of greatest need, the large fire events that require interstate support. The more often our fire fighters work together the better the service to our communities when most at need.

### The experience

Whilst fighting fires in the Northern Hemisphere is unique and specialised work there are many similarities with fire fighting in Australia. It is hot, dry and hard work. However, there are some notable differences. Canadians seem to think Australia has lots of dangerous animals, on the other hand Australians seem to think bears and cougars are more of a concern than spiders and snakes. I guess it is what you are used to.

Great to meet new people and different cultures. With the Canadian deployment fire fighters experienced working with firefighters from Mexico, South Africa and United States as they all worked to support the local firefighters. They met some great and interesting personalities and one of the highlights was the South African crews singing at the start of shift. Imagine how this would work in Australia, a bit of Cold Chisel before the briefing?

The Northern American Forests are often postcard views with large salmon filled rivers of cold water. The nature of bushfires and wildfires means that we are often required to work in beautiful places, one of the rewards of a difficult job. We

generally don't expect to be up to our knees in a swamp, which was the case for our fire fighters in parts of Alberta. As they worked in the "Muskeg".

Accommodation is in fire camps. One of the most rewarding experiences for those deployed overseas. How to place a fire camp? There must be a training package for the people that locate fire camps. They need to be on ground that is particularly uncomfortable, a quarry or paddock full of long grass. Generally situated close to transport, ideally between a highway and a railway line. Then you bring in all the facilities and a couple of big generators to compete with the rail and road noises. And if you are really lucky the airbase is co-located. You get to sleep in a tent, use portable toilets and showers. If you didn't pack a towel, the camp may supply a meter of paper towel for your shower. If you are not a lover of camping, then forest fire fighting may not be for you.

Deployments typically last for 14 days with 2 days off and then another 14 days. Then you are returned home. You can expect to have a day or two of briefings and orientation. This includes your chance to get over the jet lag. Australian firefighters are typically deployed in teams or sometimes down to pairs. You may find yourself deployed as an individual resources working in a remote area with the locals. This is perhaps one of the most rewarding opportunities and may be one of the most daunting depending on the individual.

▲ Early morning at case camp for the China Know Fire, 2014. The tents in the foreground are our luxury accommodation for our 14 day shift.

### A national approach

With the increase in large fires around the world there is a growing preparedness by countries to be able to provide international support. EMV has done an excellent job in managing the 2015 deployments but should not be expected to carry this burden on behalf of the ESO's indefinitely. Emergency Service Organisations around Australia are working on a way forward. As a sector we continue to work more closely together as we strive to provide the most professional service possible to the community, both here and overseas. It is logical to assume that we will also master international deployments in time.

### Are you prepared

So you want to fight forest fires in the northern hemisphere. Then you need to be prepared. Forest fire experience in Australia is an important box to tick. You need to have a valid passport. You need to be prepared to experience the challenges described above and the typical fire scenarios, like mop up. And you need to do it all while representing us, as Australians, in a professional way. You will be challenged, bored, frustrated, cold, hot and tired. And that's just getting through customs. If you can tolerate the frustrations, you will have opportunities to be inspired and impressed with what is ultimately a very rewarding experience.

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# Better procurement needed in fire and rescue operations

The need for fire-fighting and rescue organisations to optimise their costs is not a new concept, but it is fair to say the challenges of managing the spiralling costs and increased demands on resources are only continuing to make the landscape more complex.



**Sigi Osagie**

Sigi Osagie is a leading expert on effectiveness in Procurement and Supply Chain Management. He helps organisations and individuals achieve enhanced performance growth to accomplish their goals. He is the author of the highly-acclaimed book *Procurement Mojo – Strengthening the Function and Raising Its Profile*.

**F**or most fire and rescue organisations, purchasing spend is the largest or second largest area of expenditure. Consequently, Procurement departments have been expected to deliver greater financial value improvements in recent years. Public sector bodies have been forced to find ways to secure more value from every pound they spend in supplying services to their end-users.

It's no surprise that for many fire and rescue organisations, trying to procure efficiency without compromising standards can become like the search for the proverbial Philosopher's Stone.

Cost containment isn't the only reason for the increased focus on purchasing. Averting fraud and other business risks, like the recent horsemeat scandal, is another. Recent media stories on child labour and slave wages in

some supply chains, and questionable supplier management tactics by some supermarkets are examples of the added socio-economic challenges compelling organisations of all sorts to improve their Procurement capability.

A reference to UK supermarkets might seem strange in an article about fire and rescue management. However, a report by the think-tank Reform, published last year, suggested that the public sector services should in fact adopt the same type of thinking that has cut costs and improved quality in grocery retail, high street retail, supermarkets and even car manufacturing.

Procurement practitioners in the fire-fighting and rescue sector face broadly similar underlying issues as their colleagues in other sectors. In truth, majority of Procurement functions in most sectors today still struggle with achieving the success and recognition



they crave. And Procurement is nowhere near as embedded in the fabric of most organisations as it should be.

Purchasing professionals in such functions are frustrated by the myriad of problems this brings – from regular squabbles with territorial stakeholders and budget-holders who don't recognise Procurement's role to disagreements with Finance colleagues who think "Procurement cost savings" is all smoke-and-mirrors.

## Becoming More Effective

For fire and rescue Procurement leaders and staff, it appears the biggest frustration they face is the lack of appreciation of their value-add in their organisations, and, commonly, being 'denied' the opportunity to showcase their value-proposition. As one purchasing manager put it in a blog post, "Why should I have to constantly fight to be allowed to do my job?!"

Most purchasing people agree that what Procurement wants boils down to enhanced capability and better recognition across the wider organisation. Yet most efforts to enhance Procurement are not effectively focussed at these outcomes. It's no surprise that many Procurement departments end up going through transformation after transformation.

## Procurement is About People

When you examine the challenges most Procurement functions struggle with they all relate to 'people' – whether it's territorial stakeholders; short-sighted or egotistical senior executives; or even the competencies, behavioural attitudes and thinking patterns of Procurement staff. These 'soft' issues are the root-causes of the problems that prevent most Procurement functions from firing on all cylinders.

Most efforts to enhance Procurement place overriding emphasis on improving processes and systems, with inadequate attention paid to people. Yet it is people that do the work and deliver results; not computers, strategies or processes – those things are simply tools or enablers we use to get the work done. So people matter most!

Our overriding focus on the tools and technical aspects of the purchasing work is the ball and chain holding Procurement departments back. When we expand



Image courtesy of Sigi Osagie

our thinking to embrace the fact that organisations are about people, first and foremost, we create the ability to focus on what really matters for success on the job.

Procurement functions that achieve long-term success and kudos in the enterprise always give high priority to the human factors in the purchasing domain. Those functions still seeking their Procurement mojo must recognise that purchasing is a people-centric activity; they must place greater emphasis on the people-related factors – the soft issues – that underpin or hamper Procurement success. There are two aspects to this;

- 1 The Procurement organisation – Recognising the importance of the people inside Procurement who do the work, and taking the right steps to grow the function's talent or 'people capability'.
- 2 Stakeholder perceptions of Procurement – Making a greater effort to manage interactions and relationships with people outside the function, and building a credible 'Procurement brand' to connect with these folks better.

## People Inside Procurement

An effective functional organisation is the bedrock of Procurement success, and people are the lifeblood of any organisation. But, sadly, many Procurement leaders invest inadequate time and energy on inspiring, engaging and developing their people. As uncomfortable as it might sound, this reflects a key failing; because the Procurement leader is the most critical person in the Procurement organisation.

Leadership is the glue that holds everything else together. So it is crucial that Procurement has an effective leader. An effective Procurement leader is not a 'purchasing geek' but a 'business leader', who is adept at aligning Procurement's efforts to the broader business priorities and cultivating relationships, especially at senior levels, to further Procurement's agenda. This is particularly crucial in the public sector where Procurement must operate under complex and sometimes conflicting priorities, and deal with a diverse range of stakeholders on safety-critical and risk related issues.

**Most efforts to enhance Procurement place overriding emphasis on improving processes and systems, with inadequate attention paid to people. Yet it is people that do the work and deliver results.**





Image courtesy of Sini Osaie

Procurement leaders must appreciate that building people capability means ensuring Procurement has the right calibre of individuals, who understand how their actions bolster the function's success and its reputation. This isn't about having a team with high technical expertise, such as category management or strategic sourcing. Rather it's about attitudes as well as aptitudes. Having sound technical knowledge is of limited value if you're unable to exploit that knowledge successfully because you're not organisationally savvy.

To educate stakeholders across the fire-fighting and rescue organisation and create alignment with the Procurement agenda you must be able to 'connect' with a range of personalities and win them over – you must have highly developed soft skills; competencies that enable you to navigate organisational dynamics with flair.

The most effective purchasing people are those with great soft skills – attributes like persuasive communication; self-leadership; influencing; results-orientation; and emotional intelligence. Think of technical purchasing skills as ‘Qualifiers’ – skills that simply qualify you to play in the purchasing sandpit; whereas soft skills are ‘Order-winners’, the key intrapersonal and interpersonal competences that enable you to win in the job. You can’t possibly be a half-decent professional without the

right technical skills. But to be effective and outclass your average peers you must have highly-developed soft skills.

Procurement people must be held accountable for their performance as well as their behaviours – because “performance” is not just about what we achieve; the behaviours and attitudes we exhibit are as important as what we achieve. This is particularly crucial considering the impact our behaviours have on stakeholders outside Procurement and their perceptions of our ‘Procurement brand’.

## People Outside Procurement

As difficult as it may be to accept, stakeholder perceptions and their consequent reactions are largely driven by our own attitudes and behaviours. Rather than waste energy on countless squabbles with these folks, it's far more effective to get to understand them better, and direct more effort at managing their perceptions, educating them and fostering progressive relationships. People are always more likely to buy in to your agenda if they like you or 'connect' with you as a person.

The more stakeholders feel that Procurement is meaningful to their challenges, the better Procurement's brand reputation.

The Procurement brand is the

pinnacle of Procurement success; it reflects everything the function stands for. Procurement folks can employ certain tactics to propagate positive perceptions with people outside the function, including:

- Remember that people's attitudes, behaviours and decisions are not driven entirely by logic or reason. Emotions are always part of the mix, usually beneath the surface. So develop interpersonal savvy – make the effort to establish an emotional connection with your individual stakeholders; get to know them as fellow human beings like you.
- Get close to your internal customers to develop insights on what's truly important to them; focus on nurturing harmonious and productive relationships; and leverage persuasive communication to educate them on Procurement's value proposition beyond the traditional "cost savings".
- Utilise astute PR to continuously promote a positive image of Procurement, e.g., through stories on the intranet site, newsletters, periodic executive briefings; regular engagements with critical stakeholders to keep abreast of their worlds and provide updates on the Procurement agenda; etc.
- Remember, as a purchasing person YOU are a 'Procurement Ambassador'. So ensure that everything you say or do creates a positive perception of Procurement as a credible 'business partner' function in stakeholders' consciousness.

In summary, Procurement success demands functional effectiveness – doing the right things to get the desired functional outcomes. Often, the right things are not always the most popular actions. Yet if you examine instances of Procurement functions achieving their mojo – delivering sustainable success for the individual, the function and the enterprise – you will find the embodiment of the practices outlined above.

Organisations are about people, first and foremost. The more you master these people-centric or soft issues, the more you build pathways to sustainable success for your fire and rescue Procurement function.



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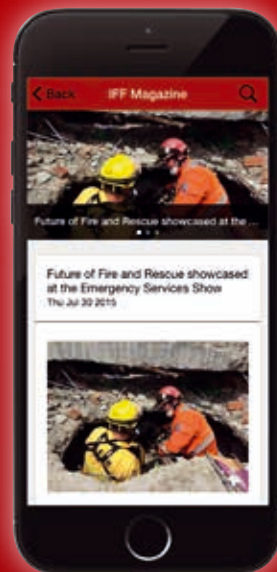
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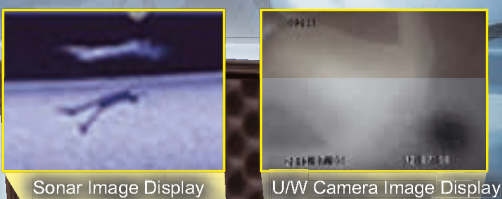
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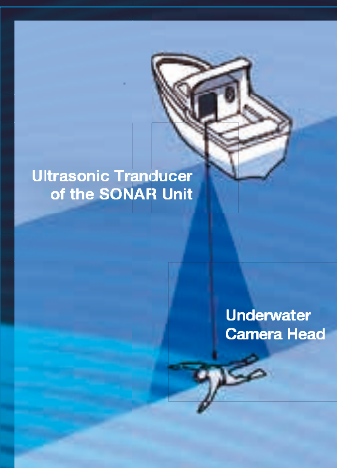
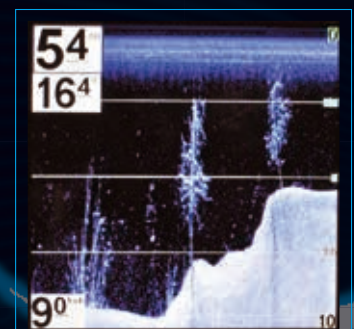
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Sonar Image Display U/W Camera Image Display

SONER Display image



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Cover image: A very special rescue.  
Image courtesy of Dumitru Polscin.

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# A true inspiration to us all – Dumitru Polscin

Before this year's Fire Department Instructors Conference (FDIC) held in Indianapolis, USA in April, the name Dumitru Polscin was largely unknown outside of Moldova.

In this special 50th issue of International Firefighter magazine we are dedicating the front cover and the 'IFF Comment' to Dumitru Polscin, a man who inspired everyone who was fortunate enough to meet him during his trip to FDIC.

Dumitru Polscin is full time firefighter from Moldova. He is based at the Central Fire Station No.2 in his home city of Chisinau and has been a firefighter for the past 13 years. He is dedicated to saving lives and protecting property each and every day, and was humbled and honoured in April 2015 when he was named 'Firefighter of the Year' in Moldova.

Chisinau is the capital of Eastern Europe's Republic of Moldova, a city with a population close to 700,000 people – set amid the blocks of Soviet-style architecture are landmarks including the neoclassical Nativity Cathedral, the dome-topped Chisinau's Cathedral Park, a plaza with a triumphal arch celebrating Russia's 19th-century victory over the Ottoman Empire and Stefan cel Mare Central Park which is named after a Moldovan Prince who resisted Ottoman rule in the 16th century.

Moldova has a very limited emergency response capability which is highlighted by the fact that only 15 fire appliances have extrication capability for a population of 4.4 million people. Moldova has 144 fire appliances which are designated as only having firefighting capability with two thirds of the 144 appliances being between 25-40 years old. A fire service report suggests that 236 appliances are needed to provide even a basic emergency response across the country.

The team at *International Fire Fighter* first became aware of Dumitru in early 2016 when we were contacted by our friends at *Task Force Tips* who were looking for our assistance to raise awareness of Dumitru's aim to get to FDIC and his *gofundme* page.

We were only too pleased to help and very quickly uploaded the news to our websites and social media sites.

Moldova is one of the poorest countries in Europe and there is no state or department funding for firefighters to travel abroad for training so this needed to be raised. A firefighter in Moldova earns on average \$250 / £170 per month so the task of raising the monies to fund air travel, a US visa application, accommodation and food, as well as the registration fee for the week-long 'Hands on Training (HOT)' and conference was a mammoth one.

The fund raising worked and Dumitru arrived in Indianapolis in time to start the 'HOT' sessions and was an instant hit with everyone he met. When asked about why he wanted to attend FDIC, he said 'I wanted to attend this conference and take as many courses throughout the week as possible, so I could bring this knowledge back to my fire department to better educate and train my brother and sister firefighters.'

'Attending this conference is very important to me and my fellow firefighters. I will be able to bring this knowledge back to Moldova and help better train my brother and sister firefighters to be safer in the line of duty, while better performing our duties to save and protect the lives of others.'

The *International Fire Fighter* team had the pleasure of hosting Dumitru during the show and also taking him out in downtown Indianapolis during the evenings to visit with his fellow firefighters from around the world.

Mark Seton, Director of MDM Publishing said, 'Dumitru is a real star, the time we spent with him during FDIC was priceless and it was a pleasure to be able to help such a dedicated and enthusiastic firefighter. He made so many friends in the short time he was in Indy – we walked into bars downtown and firefighters would start chanting Moldova, Moldova as a welcome to him!'

For many firefighters training and development is taken for granted and little thought is given when skipping educational classes or 'HOT' sessions. For Dumitru Polscin, and thousands of firefighters globally, quality training and development is a luxury that they rarely get to experience, so when they do they jump at the chance to learn new techniques, experience different practices and procedures and to soak up as much information as they possibly can. Next time you consider skipping class or moan about taking part in a drill – think of your fellow firefighters, like Dumitru, who can only dream of ever having the privileges you enjoy.

It is only fitting to leave the last words to Dumitru who wished to pass on his thanks to everyone involved in making his dream a reality.

'I express my sincere thank you and gratitude to you for reading this, and thank you so much for this opportunity. I give my word and my pledge that with this opportunity, I will do everything in my power to better train and educate my fellow brother and sister firefighters, as we work every day to keep people safe.'





## Angus Fire and CFB Risk Management deliver 'the opportunity of a lifetime'

Following the hugely successful Firefighting Foam School in 2015, Angus Fire organised a second training school in Centro Jovellanos, Spain, this April. This year the school was run in partnership with CFB Risk Management, who enhanced the Foam Training programme with Emergency Planning and Risk Management content. Centro Jovellanos is one of Europe's leading centres for firefighter training and provides top class facilities. The expertise from Angus Fire and CFB Risk Management was supported by the skill of the Centre's experienced fire trainers. The school attracted 30 x CPD points awarded by the Institute of Fire Engineers.

The aim of the course was to

- develop the participants' understanding of firefighting foams, application methods and techniques.
- introduce the participants to the equipment used to tackle flammable liquid fires.
- improve the participant's ability to identify hazards and ensure measures are put in place to mitigate and reduce risks to emergency responders, the facility and the public.

- introduce the participants to challenging practical elements of emergency planning and the extinguishment of large, full-scale flammable liquid fires.

Delegates from around the world (Hong Kong, France, Slovakia, Falkland Islands Greece and the UK) and across several industrial sectors attended the course. The main market sectors represented were Oil/Petrochem and Municipal Fire Brigades. The speakers included recognised industry experts such as Gary Cawley and Gary Douthwaite from CFB RM, Martin Hough, Nigel Joslin and David Plant from Angus Fire and the course was chaired by Ron Parry, an independent chairman.

The course programme maintained an important blend of practical fire ground training and classroom work including many relevant case studies. The practical programme on the fire ground included various supervised fire scenarios involving hydrocarbon and solvent fuels and included tank firefighting, pressurised flange fire, bund fire, tank rimseal fire and LNG fire demonstrations. The theoretical programme combined

sections on: Emergency planning and Hazard Identification, Testing Foam in the Field, Emergency Response Planning, Environmental Considerations and Tank Fire Fighting Tactics.

Safety of the delegates during training was paramount. The command and control leadership on the Fire Ground exercises was managed by CFB Risk Management.

To complement the exhausting daily programmes at the school, social programmes were arranged in the evenings for delegates and instructors.

At the end of the course participants increased their knowledge and understanding of the pressures firefighting professionals face in large-scale emergencies. They were able to develop a wider perspective of engineered systems, fixed foam equipment and the methods used to tackle a petro-chemical, oil or gas incidents. Training covered hazard identification and the ability to implement a wide ranging emergency action plan to reduce the impact of the event on the business and stakeholders. They could recognize the significance of the key decisions which are made before, during and after an emergency.

The school was again judged by delegates to be a great success and the following is just a selection of comments extracted from the feedback.

*"It was really worthwhile and certainly an opportunity of a lifetime."*

*"The school was also outstanding with world class facilities."*

*"it was an excellent event – one of the best I've been to in my 18 years in the FRS"*

Watch out for details coming soon on the 2017 Foam School and in the meantime why not have a look at the course video on Youtube (search on Youtube Angus Foam School).



For more information, go to  
[www.angusfire.co.uk](http://www.angusfire.co.uk)



Image courtesy of Angus Fire

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## TEISEN'S Large Diameter Hoses

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### Introduction

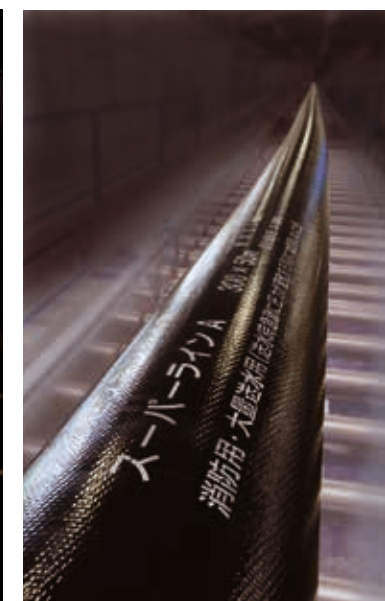
TEISEN produced its first firefighting hose in 1903, and since then, it has been the most experienced and largest firefighting hose manufacturer in Japan.

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TEISEN offers the Super Line LDH with a diameter of up to 300mm. Super Line LDH is manufactured using a one-piece construction method, extruding the cover and lining in one step, with polyurethane through a polyester jacket.

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Diameter	mm	100	150	200	250	300
	inch	4.0	6.0	8.0	10.0	12.0
Color		orange	orange	orange	black	black
Wall thickness	mm	3.5	3.5	4.0	4.6	5.0
Weight	kg/m	1.1	1.6	2.8	4.0	4.8
Burst pressure	MPa	4.2	4.4	3.6	3.0	2.8
Maximum working pressure	MPa	1.6	1.6	1.4	1.4	1.4
Temperature range	°C	-20°C ~ 50°C				



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## The GawkStopper dignity screen

Donna Alison explains the circumstances behind the creation of the Gawkstopper. I had a light bulb moment for this innovative tool when I was the first to arrive on the scene of a two car accident in 2011, where all four people were killed. After calling 911, a volunteer fireman showed up first and as we directed traffic you could see the people passing by taking photos. I told him that my belated twin and I had always talked about designing something to help stop the onlookers. He replied that the first responders have needed something like that for years, so I decided then that now was a good time to create it.

I started working on a prototype screening device that would offer privacy and dignity to the injured at any type of incident scene, sparing the victims from unwanted photos and videos. This would give first responders, who often hold up a tarp to achieve that same privacy, the free hands needed to

render aid and clear up the scene.

Joseph M. Vindigni Fire Chief City of Hendersonville Fire Department said, "My main objective is to retrain society to keep their eyes on the road ahead instead of on the accident scene to help reduce secondary accidents and road

congestion caused by distracted drivers.

"This system is an effective component of the mitigation process and will truly be an asset to any organization."

 For more information, go to [www.GawkStopper.com](http://www.GawkStopper.com)



Image courtesy of GawkStopper

## Apprentices receive Royal visit

The Duke of Rothesay (HRH Prince Charles' title when in Scotland) visited a special event in Scotland to admire the work of young engineers and apprentices involved in the build of a new fleet of fire engines for London Fire Brigade.

Babcock International Group (Babcock), which has long term contracts to manage and maintain London Fire Brigade's fleet of vehicles and equipment and deliver training for its firefighters, commissioned Cumnock-based manufacturer, Emergency One UK Ltd (E1), to build the appliances. Under the project, the first appliance will be rolled out this month, with a further 52 delivered in the first tranche until the end of 2017. E1 is the largest local employer in the area and has a longstanding apprenticeship programme. Many of its apprentices are also with The Prince's Trust and are being deployed in the build programme.

Paul Wilkins, Director of Resilience and Emergency Services at Babcock said: "Being an international engineering company we recognise how important it is to encourage and develop the next generation of engineers not just for our company, but for our economy as a whole. This event has been a great way to celebrate young engineering talent."

E1's Stuart Harrison supervised the build of the appliance and started his career as an engineering apprentice 26 years ago before rising through the ranks. His son Stuart is also an apprentice at the company. He said: "Working with a company such as Babcock in this

prestigious project is hugely exciting and a real honour for the whole company.

"It's given our young apprentices an amazing opportunity to be part of something that will positively impact not only those of us here in the Cumnock community but also the people of London."

The Duke of Rothesay has a keen interest in supporting and encouraging manufacturing and engineering job opportunities and training. He has consistently undertaken visits to factories and businesses which rely on and support training in manufacturing and engineering.

Dumfries House, was saved for the nation by The Duke of Rothesay who led a consortium of organisations and individuals in a campaign for its rescue. The Great Steward of Scotland's Dumfries House Trust was formed to develop the house and estate as a visitor attraction, as well as using it to invigorate the local community. Now fully restored, Dumfries House is at the heart of local regeneration and is open to the public for the first time in 250 years. The estate offers training opportunities through a number of The Prince's Charities, and includes a number of facilities such as a hospitality centre, engineering centre, Sports Hall and the fully restored Queen Elizabeth Walled Garden.


 For more information, go to [www.babcockinternational.com/sectors/emergency-services](http://www.babcockinternational.com/sectors/emergency-services)



Image courtesy of Babcock

## Zafira B recall

Vauxhall Zafira B cars have been recalled for a second time as a 'preventative action' due to fire concerns.

Updated figures show that so far this year London firefighters have attended 14 fires involving Vauxhall Zafira cars. Since 2013, London Fire Brigade has been called to 120 fires involving Zafira's more than double the number of the previous four year period (2009-2012). All the figures discounted deliberate fires involving the vehicles.

Vauxhall Zafira B cars recalled again over fire risk, following a series of fires.

Vauxhall spokesman said: "While the current action achieves the objective of returning vehicles to their original condition, after extensive investigations we have decided to go further and improve the overall robustness of the system."

 For more information, go to [www.london-fire.gov.uk](http://www.london-fire.gov.uk)



Image courtesy of London Fire Brigade

## AUTOMATIC DISCONNECT

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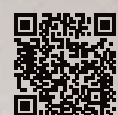
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# FLIR Systems introduces new thermal imaging solutions for firefighters

FLIR Systems announced new thermal imaging solutions for firefighters, including the FLIR K33 and K53 handheld cameras, the FLIR KF6 camera for fire engines, and two FLIR Aerial First Responder Kits featuring the DJI Zenmuse XT. These new additions underscore FLIR's commitment to providing high-quality, affordable thermal cameras for broad firefighting applications.

The FLIR K33 and K53 handheld cameras offer a single button interface and four-inch screen that simplify camera operation while on the job. With an easy-to-use interface and affordable price points, the K33 and K53 will enable more firefighters with thermal imaging capabilities so they can see through smoke, identify hot spots, navigate safely, and locate and rescue victims more easily.

The FLIR KF6 is the firefighting industry's first thermal camera designed for fire engine ladders. By mounting it on a fire engine ladder, the FLIR KF6 allows firefighters to better observe and plan how to fight a large building, warehouse, or structure fire. The KF6 also helps firefighters better assess the effectiveness of their extinguishing strategies.

Packaging the DJI Zenmuse XT stabilized FLIR camera with the DJI Inspire 1 drone, the FLIR Aerial First Responder Kits provide first responders added support from the air. Available in Advanced and Basic packages, these kits allow firefighters to gain a thermal perspective from high above the ground to pinpoint temperature variances signifying potential problems in buildings, to detect the presence of people or animals, and to monitor fire personnel in large fire scenes.

For more information, go to [www.flir.com/TICS](http://www.flir.com/TICS)



► The DJI inspire 1 Drone fitted with a FLIR stabilized camera.

## NEW: Medical Alert Stickers

A person swerving in front of you might not be under the influence, but might be having a medical issue. MAS-MV, Medical Alert Stickers for Motorized Vehicles, is a program that was created by Jessie Dove, 2012 Indiana Volunteer Firefighters Association State Miss Flame. The system hopes to provide important information about a driver within a vehicle in an auto accident. The program consists of two reflective decals that go on the front and back windshields on the driver's side. The stickers indicate to emergency personnel to look for "Information in Glove Box". Inside of the glove box is a reflective zip lock bag that holds an index card. This index card holds important information such as medical history, allergies, medications, and emergency contacts for the person within the car. The zip lock bag follows the patient from the scene to the emergency room. Each kit consists of two decals

and the identification card. This program will not only benefit the public by early identification of allergies or even a diabetic attack, but alert emergency responders to this information. This can benefit in prevention of allergic reactions, along with important medical history

that could become critical during an accident. Emergency responders know their public the best.

For more information, go to [www.squareup.com/store/mas-mv](http://www.squareup.com/store/mas-mv)

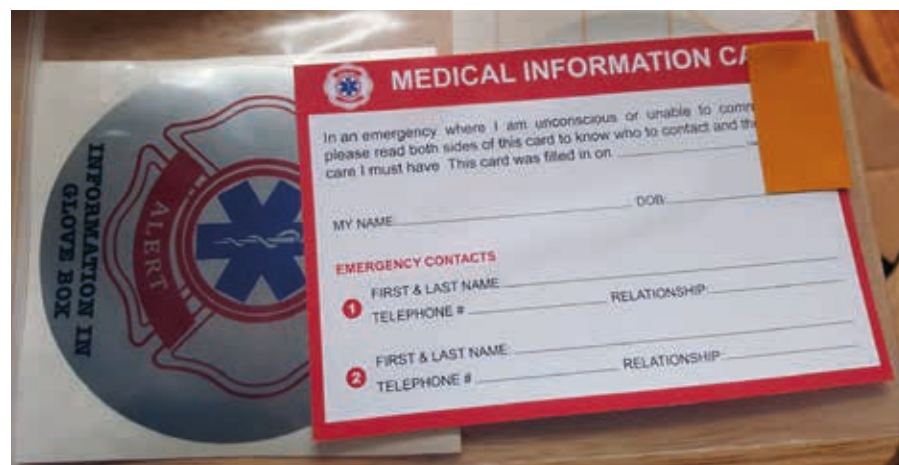


Image courtesy of MAS-MV

# Serco fire training centre first to win international approval

Serco's International Fire Training Centre (IFTC) has become the first organisation in the UK – and only the second in Europe – to receive international approval for its fire training service from the International Civil Aviation Authority (ICAO).

IFTC, based at Durham Tees Valley airport near Darlington, is one of the world's leading aviation fire training centres with around 10,000 delegates from around the world visiting and undertaking training at the centre each year. The team has invested significant effort, time and money into developing its systems, procedures and policies to comply with the exacting quality assurance standards needed for ICAO TRAINAIR Associate Membership status.

Serco's Gary Watson, IFTC business operations manager, said: "ICAO Associate Membership status not only reaffirms our position as one of the world's leading aviation training fire centres, but more importantly assures our global customers that we meet rigorous international standards in terms of the quality of our training provision. This is an enormous achievement and the whole team should be rightly proud of this recognition."

The news is expected to be welcomed by airports who – as of last month – are required to ensure that their training providers meet strict European standards.

IFTC has enjoyed a strong start to 2016 with teams from Poland, Greece and Israel choosing to complete their training at the Centre.

This week the IFTC welcomed Geneva airport firefighters who are on a five-day intensive fire training programme. Last week, firefighters from Luxembourg airport further developed their skills at the centre with exercises including black smoke burns with kerosene and liquid propane gas, providing them with truly authentic aviation fire emergency scenarios within a safe learning environment.

Late last year, IFTC hosted a delegation from the United Nations (UN) fire safety leadership team based in Afghanistan who underwent two weeks of intensive training at IFTC which they hailed as "excellent".

For more information, go to [www.iftcentre.com](http://www.iftcentre.com)

► Geneva Airport firefighters in action at the IFTC.



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## Game-changing firefighter protection

**B**ased on the Nomex® brand that has been trusted by firefighters around the world for more than 50 years, Nomex® Nano and Nomex® Nano Flex are the next generation of flame-resistant (FR) solutions from DuPont. These breakthroughs in firefighter protection represent the future of turnout gear.

### Dupont™ Nomex® Nano

This new technology was introduced to help reduce heat stress; decrease weight and bulk of your turnout gear; and help increase your mobility without compromising thermal protection.

Nomex® Nano is specifically engineered to be thinner than other advanced FR materials used for thermal liners. In fact, Nomex® Nano provides up to a 40% reduction in thermal liner thickness compared to other advanced liners available today, while providing equal

thermal protection performance (TPP).

That means a thermal liner of Nomex® Nano can reduce the weight and bulk of current turnout gear systems, helping to give firefighters increased mobility and better range of motion – without compromising thermal protection. What's more, Nomex® Nano features improved total heat loss (THL) compared to typical thermal liners with equivalent TPP, which helps reduce heat stress.

Another way that Nomex® Nano can help reduce heat stress is due to its superior moisture management. In laboratory tests comparing moisture absorption, the thermal liner made of Nomex® Nano showed approximately 30% more absorption capacity compared to conventional thermal liners – with no increase in drying time.

The bottom line? The next generation of firefighter protection is here – Nomex® Nano.

### Dupont™ Nomex® Nano Flex

Nomex® Nano Flex provides superior particle barrier protection while offering breathability, and was such a lightweight, flexible solution and you will hardly know its there. NEW DuPont™ Nomex® Nano Flex is the latest breakthrough in barrier protection for firefighter hoods.

Nomex® Nano Flex is a highly breathable, flame-resistant (FR) material with exceptional elasticity and superior particle barrier performance. It is thinner and lighter weight than other FR materials, helping reduce bulkiness and support increased mobility.

The addition of Nomex® Nano Flex to a firefighter hood composite structure provides improved particle barrier protection in the neckline and upper jaw area that historically are known to be the most vulnerable and least protected. In fact, it results in a 4X increase in barrier efficiency. What's more, the combination of Nomex® Nano Flex and an FR knit material in a firefighter hood results in a 25% improvement in thermal protection performance (TPP) compared to an FR knit material alone.

DuPont™ Nomex® is known worldwide as the leading flame-resistant fiber. More than 3 million firefighters, as well as workers across the manufacturing, chemical, oil and gas industries, emergency response and armed forces personnel, depend on its thermal protection to help keep them safe. Nomex® fiber can help enable protective apparel to have the lowest possible weight at the highest level of protection, breathability for reduced heat stress, and the ability to effectively wick away moisture. In addition to personal protection, Nomex® is used in mass transit systems, wind energy, transformers, filtration, hoses and aircraft.

◀ DuPont™ Nomex®  
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Image courtesy of DuPont

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# Ziegler

## 125 years of quality, reliability and innovations

**A**s one of the world's leading producers of fire fighting vehicles and equipment, Ziegler thinks beyond the products of those who have worked with them every day – for 125 years.

### 125 years ago everything started in an old mill in Giengen, Germany

The history of Ziegler extends over 125 years and goes back to the founder Albert Ziegler, who was active in the local fire department in the last two decades of the nineteenth century. In 1891 the focus was on the manufacturing of hoses. The firm's hoses were made famous in the circles of European fire fighters.

For Ziegler, the hose manufacturing is still an important traditional branch of the company, having produced over 60 million meters of hose – enough to wrap around the world about one and a half times.

### From the hose to the pump up to the fully equipped fire fighting vehicle

Kurt Ziegler, the son of Albert Ziegler shifted the company's focus in 1922. As he had good relations with the fire departments, he decided to offer more products for this market segment.

Therefore, he installed a mechanical workshop besides the looms and started developing a new product – the centrifugal fire pump and portable centrifugal fire pump. In 1925 the first portable pump was delivered. "Of course new, more modern and technically sophisticated models emerged in the course of many decades, although for example the 1953 developed portable pump 8/8 is still a highly valued product", notes Hans Mayr, the head of the German sales department.

"Today, the companies core competence is certainly based on an idea by Günther Ziegler, the son of Kurt Ziegler. "In 1953 he made the decision to start the construction of fire fighting vehicles and thus to become a full supplier for the fire departments," adds Hans Mayr. On the German market Ziegler sells up to 500 fire fighting vehicles of various types a year. This constitutes a market share of about 30% in Germany.

Nowadays high-tech vehicles do not have much in common with the first Ziegler firefighting vehicle which

▼ The Z4 completes the Z-series  
– fast, maneuverable and efficient.

was built in 1953 on an Opel-Blitz chassis. In 1991 Ziegler introduced the first airport firefighting and rescue vehicle of the Z8 series to coincide with the company's 100th anniversary.

Ziegler is particularly proud of the patented aluminium-panel system ALPAS, which offers a high-quality and flexible base for all superstructures. Whether this is the centrifugal fire pump, which delivers up to 10,000 liters per minute and is very easy to use, or the Ziegler crew cabin Z-Cab that is spacious and equipped with safety in mind, demonstrating the company's decades of experience.

### Since the 1990s, it is becoming increasingly international at Ziegler

It started with the company's 100th anniversary when Ziegler opened a production facility in Rendsburg in 1991. In the following years further production sites in Mühldorf, the Netherlands, Indonesia and Croatia were added. Sales offices are currently located in Italy, Slovenia, the Czech Republic and since 2014 also in China. The number of employees has thus grown to more than 1,200 people, with about 600 employed at the headquarters in Giengen.

Günter Dörflinger has lead the international sales department since 2011. As head of this department, he sees great market opportunities particularly on the Chinese market after the acquisition of the CIMC Group in 2013.

As part of CIMC, Ziegler is well funded and excellently positioned for the future. Consequently, large investments have already been made especially in the production capacities in Germany, as well as in manufacturing and development during 2015. This also supports Ziegler to provide customers all over the world with reliable and robust firefighting vehicles and equipment.

➔ For more information, go to  
[www.ziegler.de](http://www.ziegler.de)



Image courtesy of Ziegler



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**Ziegler**





# FERNO Rescue

## Total solutions for rescue equipment for the professionals that use it

**F**ERNO is the global leader in pre-hospital emergency care solutions serving emergency services, including EMS, fire rescue, mortuary, industrial safety and police. FERNO exports to more than 150 countries and has partnered with EMS, safety and regulatory agencies, and customers globally to create a new vision for delivery of emergency care. The company employs a dedicated team of customer-focused industry experts who are ready to share that vision with you.

The movement of interoperability between the various level of emergency responders within the rescue industry has led FERNO to create a portfolio of products known throughout the industry as standards in professional rescue programs to address the technical needs of these rescuers.

Participants within the FERNO Rescue group are well known contributors to the rescue industry with award winning designs and functionality for their product solutions: Traverse Rescue, FERNO Australia, FERNO Italia, FERNO UK, FERNO Norden, Spiracle Technologies and GERMA. These

▼ FERNOs ArachniPOD performs within any technical rescue scenario. Also shown are the FERNO Rescue Centerpoint Harness and Traverse Titan litter.



◀ The Traverse Mule Litter Wheel is adaptive to various environmental challenges for rescue transport.

key suppliers have developed leading patient extrication, immobilization and transportation products ranging from traditional rescue scenarios through technical rescue and mass casualty/disaster response and treatment.

The FERNO ArachniPOD (as pictured) is the world's most versatile modular total edge management system (TEMS). Components can be added or removed as required so that the Arachnipod complements existing structural or natural features. It can be constructed into many different configurations including a ginpole/monopole, bipod, tripod, quadpod, bridge system and handrail recovery monopole. Enhancing the FERNO product line is the innovative range of professional rescue harnesses which offer features that combines all the comfort, practical

features and benefits such as light weight materials, reflective thread, webbing and support padding for exceptional visibility and safety. (www.ferno.com.au)

Traverse Rescue (A FERNO Group Company) brings to the rescue scene a series of basket stretchers/litters ranging from stainless steel to titanium materials reflecting patented and award winning features for the StratLoad attachment point integrated within the frame of the baskets as well as the LocSafe feature, both for that extra layer of user and patient safety, and functionality which reflects the fine detail to care. The Traverse line extends into other patient transport products such as the Mule and Porter Litter Wheel systems which respond directly to those challenged with movement of patients in any type of terrain ranging from flat surfaces through to remote and rough terrain (www.traverserescue.com).

The FERNO Rescue platform is one that is always evolving and expanding to ensure solutions are created through innovation with both patient and rescuers safety at the forefront. Our global outreach and representation continues to be enhanced through a network of dealers who are specialists within the patient handling and rescue product industry and are always ready to respond to your rescue product needs.

For more information please contact Brent Fairweather, Director Rescue Group. Email: b.fairweather@ferno.com.

➔ For more information, go to [www.ferno.com](http://www.ferno.com)

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# 21st-22nd September 2016, NEC, Birmingham

## The Emergency Services Show

### Prevention and learning joint response

**L**essons Learnt from past incidents and the move from response to prevention will be key themes at this year's Emergency Services Show which takes place in Hall 5 at the NEC, Birmingham, UK from 21-22 September 2016. Fire and rescue personnel and industrial brigades from around the world are invited to attend the free event to share best practice with other responders, try out the latest equipment and prepare for future incidents including terrorist attacks, road traffic accidents and natural disasters.

#### Lessons Learnt Seminars

This year the show will offer a free two-day seminar programme focusing on lessons learnt. It will include case studies of successful collaborations between the UK's emergency services and sessions on training, flooding, communicating with the public through social media, risk management, organisational learning and operational response. Additional free seminars will cover innovations in Information & Communications Technology and Personal Protective Equipment.

#### Exercise Unified Response

On the London Fire Brigade stand visitors can find out more about the Exercise Unified Response (EUR) they staged earlier in the year, believed to be one of the largest

and most complex emergency services exercises ever held in the UK and possibly Europe. It was partially sponsored by the EU and involved 70 organisations from across the UK as well as teams from Italy, Hungary and Cyprus.

#### Drone Zone

As well as showcasing drone suppliers, the new Drone Zone will bring together industry specialists and end-users in the emergency services who will be making presentations on UAV technology and sharing their experiences with delegates. The programme includes presentations on risk management, privacy, security implications and regulations.

#### Home Safety 2016

Home Safety 2016 is an exciting new show running alongside The Emergency Services Show 2016 that is already generating a lot of interest. Event Director David Brown explains why: "Emergency Services Show exhibitors, such as Humberside Fire & Rescue Service, are breaking new ground with health-related partnerships. Fire and health are natural partners in both prevention and response and co-responding is becoming increasingly common across the UK."

Within Home Safety 2016, emergency services will be sharing how they are collaborating to deliver a joined up approach to helping people live safely in their homes, and equipment suppliers will showcase the very best specialist equipment the market has to offer for the safe home.

#### Live Demos and workshops

Several exhibitors are planning live demonstrations of equipment and rescue techniques. Harken Industrial's Technical Team for example will be demonstrating the operational features of the PowerSeat man riding winch, by hoisting a person to the ceiling of the exhibition hall and back down again. Water rescue demonstrations

are planned for the Pendigo Lake, adjacent to our outdoor exhibition area outside Hall 5.

Other features planned for this year's event include the popular College of Paramedic CPD Workshops.

#### Speak to Suppliers

Leading names confirmed in the impressive indoor and outdoor exhibition include Bristol Uniforms, PBI Performance, Draeger, Holmatro, Weber Rescue, Emergency One/Clan Tools & Plant, Ferno, Openhouse Products, Physio-Control, Scott Safety and Interspiro.

Visitors with an interest in vehicles will find leading names such as Mercedes-Benz Vans, BMW, Volvo Emergency Services Cars, Volvo Trucks and Terberg DTS as well as Incident Command Units and welfare units, all types of in and on-vehicle ancillary equipment, including communications and IT, from providers like Primetech and Excelebrate Technology.

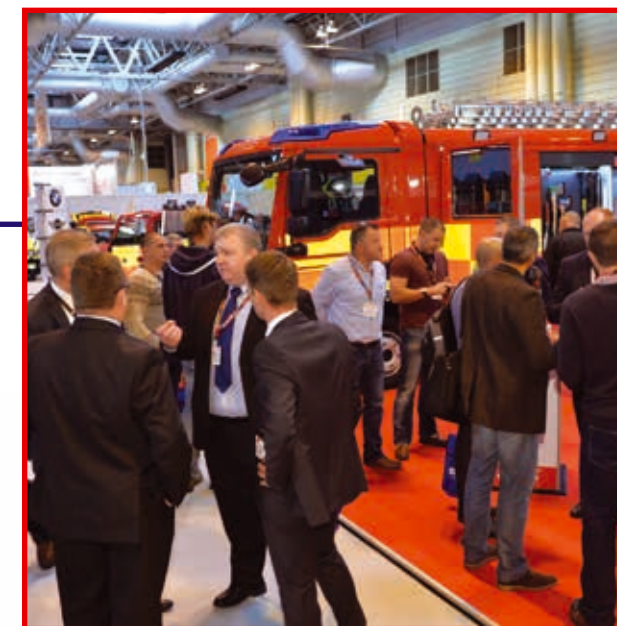
#### Valuable Opportunity to Network and Form New Partnerships

Aimed at developing partnerships between voluntary organisations, non-governmental organisations and fire and rescue services, The Collaboration Zone is a networking focus of the exhibition. It incorporates the UK SAR Zone where visitors can meet with Mountain Rescue England and Wales, HM Coastguard and British Cave Rescue Council.

#### Registration

Entry to the exhibition and seminars is free. The NEC is linked to Birmingham International Station and Birmingham Airport and directly accessible from the UK motorway network. Parking for visitors and exhibitors is free of charge.

 For more information, go to [www.emergencyuk.com](http://www.emergencyuk.com)



## Bringing the Emergency Services together to improve public safety

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- Learn from past emergency situations at the **free seminars**
- Get up to speed on UAV technology in the **Drone Zone**
- Watch **live water rescue** demo's

For more information visit [www.emergencyuk.com](http://www.emergencyuk.com).

## ESS - the only show for the entire spectrum of the Emergency Services

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# Argus Thermal Imaging Cameras

## The UK Fire & Rescue Services' most trusted brand of TIC

**W**ith extensive knowledge of customer needs, argus innovations are always designed with the user in mind – whether it's unique design, unmistakable application of colours or the highest dynamic temperature range. All the cameras allow users to visualise heat energy to see in total darkness and through smoke. In many scenarios the technology can be lifesaving.

The latest range of cameras, the Mi-TIC family, are the lightest NFPA 1801 certified cameras available and all our cameras are manufactured in the UK where they are subjected to the strictest quality processes.

### A history of innovation

The argus line of thermal imagers have been serving firefighters for over 35 years. Inventing the first TIC in response to naval ship fires during the Falklands conflict, we made the first ever handheld thermal imaging camera for the fire service.

The TIC was then adopted by UK Naval firefighting personnel to allow users to navigate through smoke filled compartments on naval vessels.

We also designed the first commercial hand-held thermal imaging camera ever used by US firefighters.

### The new Mi-TIC cameras

The complete range of thermal imagers are now shipping to firefighters around the world. The new Mi-TIC family came out on top in nearly every brigade trial throughout 2013, scoring highly in image quality, robustness, physical size and seamlessness with firefighter PPE. Standard features across the range include:

- Image and video recording for post-operation and training review
- 6 application specific modes for easier image interpretation
- Dynamic Scene Enhancement (DSE) technology to increase the contrast between the fire and important details at lower temperatures such as exit point and obstacles
- Image Freeze function to investigate potentially high temperature areas in the fire scene (e.g. loft space) with the shortest possible exposure time
- Software configuration tool to customise button functionality
- Space-saving truck mountable charger, capable of charging camera and spare battery simultaneously

Every Mi-TIC is supplied with a unique dual use desktop/in-truck charger station which securely retains and charges both the thermal imager and a spare battery. The charger stations can be daisy chained together, up to a maximum of 6 units.

### The Mi-TIC E

The – Mi-TIC E is the world's smallest high resolution thermal imager for firefighting applications. The camera provides a crystal clear image with dynamic range up to 760°C (1400°F) and at the same time see very low temperature objects, which is ideal for casualty searches.

**PERSONAL** Weighing approximately 765g (1 lb 11oz) the Mi-TIC E is a small format thermal imager that can be easily and comfortably held in the palm of your hand.

Unlike many thermal imagers, the Mi-TIC E design allows it to be worn in multiple ways – in the hand, inside a pocket, clipped outside a pocket, clipped to a lanyard or hung around the neck.

**SIMPLE** With a thumb operated green on/off button and superb start up time of 5 seconds, the Mi-TIC E is simple to use.

**SAFE** The use of lithium iron phosphate technology ensures the Mi-TIC E delivers 2 hours of battery life over 1,000s of cycles. They are inherently safe due to the use of patented Nano phosphate® technology.

- The lightest and most affordable NFPA 1801 certified thermal imager
- Unique design is small and wearable at just 65g (1 lb 11oz)
- High dynamic temperature range to 760°C (1400°F) for excellent detail in day-to-day fire scenarios

### The Mi-TIC S

The Mi-TIC S is the world's smallest thermal imager to feature a large format, high resolution display for advanced firefighting applications. The camera provides a crystal clear image with a superb dynamic range: you can clearly view extremely high temperatures up to 1100°C (2000°F) and at the same time see very low temperature objects, which is ideal for casualty searches.

- Larger 3.5" display for a clearer view
- Light-weight at only 870g (1lb 15oz)
- Extended dynamic temperature range to 1100°C (2000°F) for greater scene detail in larger, hotter fire scenarios
- Enhanced feature set including laser pointer to aid communication
- Heat/Cold Seeker
- Electronic compass for greater scene awareness

 **For more information, go to**  
**[www.argusdirect.com](http://www.argusdirect.com)**

# SEE THE DIFFERENCE

# Mi-TIC<sup>TM</sup>S



## THE NEW Mi-TIC S FROM ARGUS – THE BEST TECHNOLOGY MADE SIMPLE

- The lightest TIC available
- Best in class features come as standard
- Unmatched image quality with Dynamic Scene Enhancement™ (DSE)

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## HeatSeeker Technology & Design

### Making a commitment to save the lives of firefighters'

**H**eatSeeker Technology & Design, LLC, based in Knoxville, TN, has made a commitment to save the lives of firefighters around the globe by producing products that assist in rehabilitation on emergency scenes. There have been multiple studies conducted that evaluated the causes of injuries and deaths of firefighters as well as the amount of money spent on treatment and replacement due to lost time. HeatSeeker Technology & Design, LLC is making rehab a tactical consideration.

More firefighters die in the line of duty from heart attacks than from any other cause. The second leading cause is slips, trips and falls. While the two may seem unrelated, previous research suggests that heat stress may be a common causal factor in both, heart attacks in overweight firefighters with high blood pressure and slips, trips and falls. While departments worldwide have policies and procedures in place for rehabbing line firefighters, there are still an unacceptable number of fatalities and injuries every year due to these factors.



▼ Rural Metro firefighters taking a break from ECL class.

▲ Rural Metro firefighter's Derrick Kaucher and Lt. Eric Knoefel cooling at a working structure fire in Knoxville, TN.



In 2010, there were 71,875 line of duty injuries and 72 line of duty deaths in the United States. 49% of the deaths were due to sudden cardiac death. While being able to withstand the elevated heart rates through aerobic exercise and fitness training, the stress cannot be eliminated. The increased body temperatures have several impacts on the bodies of firefighters.

These injuries and fatalities not only have an impact on the fire protection community but on the communities that they protect as well. Another impact that must be considered is the monetary impact that it has on the economy. According to the National Institute of Standards and Technology (NIST), the total economic burden to the nation for addressing and preventing firefighter injuries is \$2.7 billion to \$7.8 billion annually.

Images courtesy of HeatSeeker Technology & Design, LLC





Image courtesy of HeatSeeker Technology & Design, LLC

Personal Protective Equipment (PPE) worn by firefighters contributes to an increase in core body temperatures of working firefighters. While this equipment is intended to protect the body from the dangers of the environments that firefighters encounter, it also retains the heat that is built up inside. Natural methods of cooling the body include sweating for evaporative cooling, and increasing heart and respiratory rates to assist in disseminating heat from the body. During fire ground activities, disseminating heat is at best difficult and often times near impossible. Elevated

▼ Rural Metro Explorers cooling at the training center!



body temperatures increases the clotting factors of blood which may play a role in sudden cardiac death. Dehydration greater than 2% of the body weight of an individual will adversely affect mental function of simple tests. This can lead to poor decision making and in turn increase the chances of taking unnecessary risks.

Many of these issues can now be addressed with the addition of a new technology developed by HeatSeeker Technology & Design, LLC which is based in Knoxville, TN. HeatSeeker Technology & Design, LLC saw a need for making firefighter cooling and rehabilitation a tactical consideration and developed a tool to assist in this effort. The innovative Six Shooter, as well as other products available from the company, is able to lower air

▲ Some of the first test days using a basic garden hose in the back yard!

temperature as much as 30°F to assist in cooling firefighters and lowering their core temperatures to help in preventing cardiac insult and other injuries.

These products can be attached and left on discharges on any fire apparatus and utilized with little to no set up. They utilize the water from the booster tank on any pumping apparatus or municipal water system and uses less than 3gallons of water per hour. They are adaptable to any hose or appliance that is carried on most any apparatus for more applications as well. The cooling provided by these tools can have a major impact on lowering both injuries and sudden cardiac deaths suffered by firefighters globally when used in conjunction with fitness activities and medical screenings as outlined in NFPA guides 1582 and 1583.

HeatSeeker Technology & Design, LLC is currently testing other products to be available soon that are geared toward the same campaign against firefighter and sport's related injuries and fatalities around the globe. A full line of the products offered by HeatSeeker Technology & Design, LLC is available at [www.firegroundrehab.com](http://www.firegroundrehab.com). We are now starting a second campaign and will be out soon. [www.HeatSeekerArmy.com](http://www.HeatSeekerArmy.com). The battle has begun to reduce LODDs!! The products offered are created by firefighters for firefighters in the USA.

➔ For more information, go to [www.firegroundrehab.com](http://www.firegroundrehab.com)

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# Firefighter Wayne Roe: My experience of life as a *Big Issue* seller

**R**ecently I was lucky enough to take part in Vendor Week supporting the Big Issue foundation to highlight issues of homelessness and poverty.

The Vendor Week is a time when well known faces, public figures and supporters become vendors, selling the magazine for an hour or so and is supported by the International Network of Street Papers, a global network of more than 100 street magazines. As part of our commitment to working with all parts of the community I, on behalf of West Midlands Fire Service, went along to take part.

On the day of the experience and after

arriving at The Big Issue Foundations HQ, my morning began in much the same way as a new vendors would have. I was offered a cup of tea and taken into a room to fill out some paperwork. This is an opportunity for the staff at the foundation to get to know you and identify areas where they can be of assistance. I was surprised to see the support started way before any magazines were sold, ranging from housing, addiction support to even visiting a dentist. We then watched a short induction video which featured tips and advice from other vendors. After being badged up and collecting my first magazines, I was ready to make my way to the "training pitch", an area suitable for a new vendor like me.

I met with Ollie, a Big Issue vendor and my mentor for the next hour. He gave me some tips, most notably to smile then kindly stepped aside to let me sell on his pitch.


I donned my vendor jacket and started my sales pitch. I had heard the vendor jackets had been likened to an invisibility cloak, and I was now started to see why. People avoid eye contact, or even worse avoid you completely by changing their course. I felt like a drop of washing up liquid in a bowl of oily water, with all the oil suddenly moving away to the edges. After a whole hour I had sold four magazines. I asked Ollie how he felt when people purposely don't acknowledge him, he said he keeps smiling, remains polite and just carries on – but deep down it can get to you and it takes some getting used to.

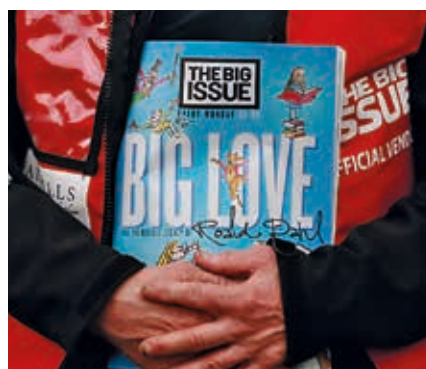
As uniformed firefighters we are used to almost universal welcomes wherever we go, whether it's the look of relief when arriving at an emergency, or the excited faces we see on our school visits. It's no surprise given that the fire service was ranked as one of the most trusted professions. So to experience a complete reversal of that trust and respect just because I put on a Big Issue Vendor Jacket was quite an eye opening and humbling experience.

The Big Issue Foundation believes in hand ups not handouts, as each vendor first buys the magazines for £1.25 before selling them on their pitch for £2.50. It's open to anyone blighted by poverty, giving people the opportunity to earn a legitimate income. Most importantly, they are then engaged with an organisation that can help tackle causes of financial and social exclusion. In much the same way as West Midlands Fire Services campaign of improving lives to save lives campaign seeks to tackle the causes and not just the problems.

So next time you see an Official Big Issue Vendor, don't be afraid to speak to them and maybe even buy a magazine (it really is a good read!)

PS - Fancy giving it a go for yourself? Why not volunteer for a vendor experience yourself?

 For more information, email [kathryn.drake@bigissue.com](mailto:kathryn.drake@bigissue.com)



## Our employees fight fire and so do our products



*My name is Magnus.  
I am working with product  
development at Fomtec.  
This picture is from a fire  
test in Sweden. Follow us  
if you want to find out more  
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# Protecting Lives, the Environment and Critical Assets

FOAM FIREFIGHTING

## A challenging time for selecting foam

There has never been a tougher time for fire professionals to make decisions about which type of foam they should use and how they should apply it to their flammable liquid risks. With the changes in environmental legislation, larger and larger storage tanks, the increasing use of geodesic tank roofs with internal floating roofs and new foams reaching the market every month, it is not surprising that making the correct choices can be a daunting task.



David Plant

### Bulk Flammable Liquid Storage Tanks

This year marks the 10-year anniversary of the Buncefield (UK) emergency, 7 years since Jaipur, and 3 years since the Bankstown incident in Sydney. All of these incidents had major impacts on the lives of the people affected by these events, both locally and globally, and each of them required a very specific type of emergency response.

Crude oil contains every oil derived product from bitumen to butane and as a result any fire is a very complex scenario. Careful planning, a well maintained system and the most applicable foam choice is paramount. Open top floating roof tanks can reach diameters in excess of 110m and require significant fixed protection systems.



Full surface nozzle.



Full Surface top pourer.

Lightning strikes within a tank farm which contains processed or blended products such as petrol or gasoline, can result in catastrophic consequences. Boil overs in a crude oil storage tank can escalate rapidly into multi-tank fires and the protection of a bund is especially important as the surface area is much larger than that of a tank.

Traditionally, the ideal foams for these extreme hydrocarbon fire scenarios are the fluorine containing foams such as AR-AFFFs or fluoroproteins. Angus Fire manufactures a number of high performing foams in these categories such as TRIDOL<sup>®</sup> ATF Ultra 1-3%, FP70<sup>®</sup> and TANKMASTER<sup>®</sup>, which are the preferred choice in many international high risk sectors.

In recent years the foam manufacturers have invested heavily in reformulating firefighting foam concentrates to increase

Angus Fire is the global leader in firefighting technology with a long history of manufacturing premium fire protection products.

- Integrity Foams: C6 and fluorine-free foam concentrates
- Foam equipment: portable, mobile and fixed applications
- Duraline: The world's leading fire hose
- Nozzles
- Portable Pumps

Angus Fire Ltd  
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**ANGUS  
FIRE**

David Plant is Global Product Manager at Angus Fire and a Director of the US-based Fire Fighting Foam Coalition (FFFC).





Images courtesy of Angus Fire



▲ Big Flow system involves pump sets, extra-large diameter hoses and high capacity monitors.

◀ Floatafoam is a fully automatic foam delivery system.

their environmental credentials. Today, the introduction of the so-called C6 foams, which are based on very pure C6 short chain telechelic chemistry instead of the long chain C8 chemistry, has radically improved the environmental aspects of these foams without sacrificing their fire-fighting performance.

In terms of equipment used to apply foam concentrates, there is a range of fixed foam equipment specifically designed for storage tanks. Open top floating roof tanks, have traditionally only had their rimseal area protected through manually activated rimseal foam pourers. Angus Fire manufactures an automatic system called FLOATAFOAM, which comprises a number of fully automatic foam delivery modules designed to detect and extinguish floating roof tank rimseal fires in their infancy. Recent developments have brought the introduction of full surface pourers and

full surface nozzles for targeting the total surface area of these tanks. In addition, many users have invested in mobile BIG FLOW systems involving pump sets, extra-large diameter feed hose and high capacity monitors giving them the confidence of being able to fight a full surface fire remotely.

Some tank owners are investing in both fixed and mobile protection for their tanks, for maximum security.

The use of medium expansion foam systems to protect the bunds around the tanks is also a new suppression and firefighting technique which prevents the fire-fighters being put at risk, should the tank be breached or the feed lines rupture.

### Municipal Fire Departments

The challenge in selecting the right foam for a municipal fire department is especially complex.

Municipal firefighters can be faced with any kind of flammable liquid fire and are best served with a multi-purpose foam concentrate. An alcohol resistant, fluorine containing foam will give the best firefighting performance. In terms of equipment some of the biggest

challenges for municipal firefighters come from ensuring the foam concentrate is induced correctly into the water lines. Many alcohol resistant foams contain high levels of polymer which make correct induction difficult particularly with portable foam equipment. A solution to this is the use of a polymer free foam such as Angus NIAGARA<sup>C6</sup> which overcome these issues and ensure correct mixing.

In addition, municipal firefighters are under great pressure to consider the total environmental impact of firefighting. It is vital that a foam concentrate is selected with the best fire-fighting performance, but today there is also significant drive to choose a foam concentrate with as lower an environmental impact as possible. When the main objective is to minimise the effect of the foam on the environment, then there are fluorine free, alcohol resistant products on the market with good fire performance (such as Angus RESPONDOL). These foam concentrates are welcomed by the environmental bodies as they contain no fluorosurfactants. However, it should not be forgotten that these products too have environmental issues in terms of aquatic toxicity.

### Aviation

The preservation of life is paramount at any aviation emergency, considering the likelihood of rapid escalation into a major incident and the certainty that there will be people inside. So much so that aerodrome firefighters are tasked with creating a survivable environment within, or around, any aircraft to enable self-evacuation or rescue of passengers. Fuels used in this industry are highly combustible and release tremendous amounts of heat when they are burnt (due to their high calorific value). Jet-A and Jet-A1 aviation fuel is stored in large quantities in tanks, tankers and aeroplanes themselves at various locations around the airport. Film-forming foams such as Angus Fire's PETROSEAL<sup>C6</sup> and TRIDOL<sup>C6</sup> are ideally suited for this application achieving Level B or C passes against the ICAO (International Civil Aviation Organisation) performance test criteria. (ICAO sets three levels of performance, A, B and C with C being the most demanding).

However, today airports are under ever increasing pressure to control their environmental footprint. In these

cases, consideration should be given to a fluorine free product such as Angus Fire's JETFOAM (1%, 3% or 6%) which is a fluorine free alternative with ICAO level B certification.

Training is a critical part of the aviation fire-fighter's role and where the majority for foam is used. For these situations specifically formulated training products exist such as Angus Trainol or TF foams.

### Approvals

Key to buying a foam concentrates is to ensure that the correct approvals are in place for the risk being covered. Foams can be approved to EN, ICAO, Mil-F, Lastfire and UL, as well as many more. UL links the foam to the equipment being used to give a system approval.

All these approvals focus on different criteria and may give greater priority to certain aspects of performance.

▼ JetFoam: Fluorine-free aviation foam for extinguishing aviation fuel fires (Jet A and Jet A1). Tested to EN1568:2008 part3. Exceeds ICAO 2013 Level B.



Image courtesy of Angus Fire





Image courtesy of Angus Fire

▲ Respondol ATF is the latest foam concentrate from Angus Fire; a fluorine-free foam manufactured to extinguish all types of liquid fires. Available in various induction rates.

In aviation, the focus needs to be on rapid extinction to free passengers from the aeroplane. In large storage tank fires, a foam with better heat resistance and post-fire security is essential. If the foam breaks down quickly post fire and needs to be continually topped up to ensure no re-ignition takes place, it has a significant impact on resources and logistics.

Every test/accreditation focuses

slightly differently on knockdown or burnback resistance so it is important to look out for the approval which is going to be most applicable to individual risks.

Approvals play a vital role in the selection of foam concentrates. In most cases they represent not just an indication of quality but may be user specific. That is why manufacturers strive to obtain a wide range of approvals, to support as many markets and end-users as possible.

#### What should be the decision making process?

Professional firefighters often ask which foam they should be using. Regardless of what the manufacturers promote, the

right choice should always be based on the user's risk profile. Risk isn't just the fire, risk needs to include how much emphasis is placed on knock-down, burn back resistance, post-fire security and the environment (air, soil and water). Talking with manufacturers and being informed of the latest developments is important. Manufacturers know about their products and have a tremendous amount of information to share, which can then be augmented this with feedback from fellow firefighters and experienced professionals.

#### What is the future for foam?

The primary consideration in an emergency is to protect life. The environment comes next and then assets. Foam manufacturers, response agencies, approval bodies all work hard to find the best balance between high performance and minimal environmental impact. The last few years has seen an unrivalled investment by the foam manufacturers in product development. This is likely to continue for the foreseeable future as attempts are made to produce fluorine free products that match the fire-fighting performance of C6 fluorine containing foams. This day is still some way off. So far, no fluorine free foam manufacturer has discontinued their fluorinated foam production. In fact, recently a key advocate of fluorine free foams, launched a new AFFF foam concentrate with Mil-F approval. To achieve this approval a foam concentrate currently requires fluorosurfactants.

With all this level of research, undoubtedly new and novel solutions to the current foam issues will appear over the forthcoming years.

As a responsible manufacturer Angus Fire continues to research, develop and bring the best possible products to the markets. In addition Angus Fire offers a variety of services to support the fire industry. Emergency Foam Service, Foam Testing Service and Firefighting Foam School.

To request a copy of the latest Foam Brochure and the Tank Protection Brochure please email [general.enquiries@angusuk.co.uk](mailto:general.enquiries@angusuk.co.uk)



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**The primary consideration in an emergency is to protect life. The environment comes next and then assets. Foam manufacturers, response agencies, approval bodies all work hard to find the best balance between high performance and minimal environmental impact.**



# Latest glove technology and what's important in gloves

Gone are the days when OSH is accompanied by monstrosously bulky clothing and severely restricted movement. An example of this are protective gloves, which not only offer high standards of protection, but have also reached new levels in terms of comfort and dexterity – something that seemed unthinkable just a few years ago. One reason for this is the use of high-tech fibers and innovative manufacturing technology.



Sina Seiz

Sina Seiz has successfully completed a Bachelor degree in Media Management specialising in Public Relations and Communication Management. She did her internship semester in the marketing department at a company in the field of fire protection clothing in London. Sina chose the Robert Bosch GmbH to accompany her in the Master's degree in General Management, where she has been working for two years and graduated in 2015 having successfully completed her dual master's program as Master of Arts specialising in Marketing and Communications.

**T**he most common accident, making up 34.5% of all injuries involve the hands, with the forearm and wrist among the most vulnerable parts of the body. 20% of injuries affecting the hand can be attributed to the thumb and 18% to the index finger.

▼ The future of hand protection. Full textile glove with temperature measurement.

58% of all accidents result in superficial injuries such as abrasions, lacerations, stab or cut wounds.

By wearing *cut resistant* gloves, the risk of many hazards can be minimized. Although the name cut resistant gloves is somewhat misleading, the term *cut retardant* gloves is more appropriate because it does not give the impression that a glove can prevent cuts completely. The point is rather to reduce the impact



Image courtesy of Seiz

of cuts as far as possible by wearing protective gloves. Still, more than half of the hand and forearm injuries could have been prevented through the correct hand protection, as the standard of personal protective equipment has developed rapidly in recent years. New technologies ensure that work gloves are more comfortable, safe and fashionable than ever before. In the past the rule of thumb was that the higher the cut protection function, the thicker the material. This is why a high level of cut protection was long associated with impaired dexterity and limited ergonomics for the wearer. Those days are thankfully long gone. Thanks to new, high-tech fibers, the issue is resolved today. While cut retardant gloves were formerly made of leather, in many cases they are knitted today. Many fibers have properties which have proved to be extremely beneficial in practice.

Responsibility for comfort protection is primarily the role of high performance fibers such as Nomex® for good heat protection, KEVLAR® for protection against cuts and a GORE-TEX® membrane for durability, breathability and water resistance.

While other membranes like the PU membrane can be torn like a garbage bag, high-quality membranes are considerably durable. Each of these materials has its own features, which makes manufactured gloves more powerful than a glove made from natural materials like cotton or leather. By combining different materials, gloves can be produced, which in addition to their multifunctional property profile, ensure maximum comfort and dexterity.

*Thanks to the latest production methods, it is possible to combine fabric from different fibers and to process these into multilayer protective gloves, without compromising dexterity. It is always recommended to provide two pairs of gloves, one pair for firefighting and one pair for rescue. Only then can the various tasks of a firefighter be optimally managed. If the protective properties of a fire fighting glove are not required, then the use of the second glove is recommended.*

## Textile vs. leather

Over 20 years ago the first textile firefighting glove was invented, and has since set out on its triumphant march all around the world, although in some

countries, pure leather gloves are still favored. Undoubtedly, leather palm gloves provide a pleasant-to-wear sensation and the gloves are soft and grippy. Grip is essential when working with gloves as this ensures that the item being held doesn't fall out of the hand – even if it is smeared with oil and therefore slippery. For this reason, textile protective gloves are provided with a special anti-slip palm. There are endless variations of materials and processes, from Silicon-Carbon coatings up to ribbed anti slip coating, modern high-performance materials which provide the necessary grip – these are no less effective than leather.

The biggest drawback of leather is shrinkage in heat, a property which is nowhere more fatal than in firefighter's protective gloves. Full leather shrinks from 180 degrees Celsius, split leather from 250 degrees and the insufficient abrasion resistance and decreased washability does not make leather well placed for this function.

Only a few manufacturers mix leather with modern textile materials that stop the shrinkage and rely on temperature-resistant split leather, which begins to shrink at 350 degrees due to a special tanning process employed. Full leather cannot be provided with a higher temperature resistance by the special tanning process, as additional mineral tanning would harden the soft scar leather.

## Standards and Protection Levels

How can a cut retardant glove be recognized? Simple: a pictogram showing a hammer and a numeric reference to the relevant standard EN388 can be found on the label or on an attached data sheet. EN388 defines the mechanical risks and the second number of the four digit code under the icon represents the average level of cut protection. The scale is from one to five, the higher the number the more cut retardant the glove. Anything from Level 3 and higher is regarded as a cut retardant glove with this classification being sufficient for all conventional tasks involving sharp objects. Although people working in high risk environments, for example using cutting tools, require gloves with a Level 5 protection rating. Rescue gloves must be classified as EN388-3233.

Firefighting gloves should protect against mechanical damage (stab, cut, tear), radiant heat and flames, moisture



▲ SEIZ® Fire-Fighter Premium is the world's best-selling firefighters glove.

and against splashing or falling, burning, glowing parts and sparks. They also provide reliable protection from rain, cold wind and chemical effects and must also comply with other specific conditions. Protective gloves for firefighters must be certified in accordance with EN659. Here, water resistance, breathability, abrasion resistance, cut, puncture and tear resistance, protection against contact heat, protection from radiant heat, chemical protection, washable at 60 degree and durability are important. Abrasion resistance must reach at least Level 3 out of 4 and cut resistance is Level 2. Also, a high tear strength to a minimum of Level 3 and stick strength to a minimum of Level 3 are also necessary. The burn behavior and behavior in radiation and contact heat is also evaluated with firefighters gloves. In extreme situations, the glove must be able to be removed from the hand in less than three seconds.

The use of gloves in Category 1 should be carefully considered as these gloves provide a low protective ability. They are





► The seamlessly knitted rescue glove SEIZ® Hornet convinces with best performance values.

regarded as simple PPE therefore only offer protection against minor risks. Gloves in Category 2 are suitable for rescuing and protect against intermediate risks. An instruction manual or an information sheet is supplied with the gloves and the manufacturer must establish the technical documentation and also conduct an EC-type examination. Protective gloves in Category 3 protect against so-called deadly dangers. Here, the manufacturer recognises that failure of the gloves will result in severe health implications to the wearer – this also includes PPE, where their failure will result in severe health implications to the wearer. In addition to the technical documentation and the EC declaration of conformity, the manufacturer must undertake an EC type-examination using a certified entity and ensures the quality of its products against the EC quality assurance system. Well-known manufacturers test the quality of their gloves annually on the basis of the applied certificate.

### The proper handling of gloves

The correct sizing of gloves is the most important part of ensuring user safety. This may sound banal, but we always hear that firefighters do not like to wear their gloves because they are too large or too small. The size is fundamentally important for the protection function and therefore the gloves should be tested first to ensure they fit properly.

Another point that also sounds very banal is about removing the glove correctly as firefighters are not necessarily elfin beings and often tear down the glove from the cuff over the hand. This method may have proved effective when pulling off a sock but when taking off a glove, this is certainly not advisable. Rather, the glove should be held at the fingertips so the hand can slip out smoothly. Once removed the gloves require careful examination, to ascertain if they were damaged during use or are excessively dirty and require cleaning or maintenance. A highly contaminated glove should never be returned to the locker – the times when a firefighters credibility is measured by the amount of dirt on their helmets and gloves are long gone. Hygiene is paramount and gloves should be cleaned regularly and replaced where there is doubt about their usability.

The washability of gloves has always been rather difficult to perfect. The limited washability of leather gloves has already been mentioned, but there are other difficulties which are not immediately apparent and relate to the gloves membrane. Gloves with simple PU membranes leak in less than 10 washes whereas high quality gloves experience no disintegration even after 30 washes at 60 degrees. The membrane remains waterproof and protects the wearer – therefore, attention must be paid to the use of a high-quality branded membrane.

Fabric softeners and stain removers must never be used and velcro fasteners must be closed properly to ensure it doesn't cause friction damage to other materials. After washing, the gloves must be properly dried and it is advisable to hang the gloves up by the fingertips and allow them to air dry naturally. Gloves should never be placed in the clothes dryer and never be greased or impregnated as this would cause them to become flammable.



► The SEIZ® XF C leaves nothing to be desired in terms of design, safety, comfort and quality.



◄ The rescue glove SEIZ® Survivor is equipped with a Crosstech® Insert with X-TRAFIT Product Technology.

### The future of gloves

The future of glove technology goes beyond high-tech materials and progressive production, as it is now possible to combine technical equipment with hand protection and to upgrade a glove to warn the wearer of danger. Enter the SEIZ® Lasertemp – a world first.

SEIZ® Lasertemp is a patented measuring device that can be attached on the back of a firefighting glove. The worldwide innovation has been developed for fire departments around the globe to warn them of the dangers of heat at an early stage. Even today firefighters are still taught to measure the surface temperature of closed doors using the back of their bare hand – this means their hands are not being protected by the gloves. Lasertemp enables accurate temperature measurement from a safe distance.

The compact safety tool displays the temperature of a surface – which is measured by an infrared sensor (pyrometer). The measured temperature is indicated on two displays: one in degrees Celsius and on the other side using light-emitting diodes. In temperatures up to 60 degrees Celsius the green LEDs are illuminated and for temperatures up to 360 degrees Celsius red LED's are illuminated. Furthermore, a built-in laser pointer enables non-verbal communication in the risk area. The Lasertemp is turned on by shaking the hand in a jerky movement and after one minute of no activity the electronic device automatically turns off to conserve the battery. The built-in rechargeable battery provides 800 hours of operation or one year on standby.

### Following extensive practical tests, Lasertemp is now launched to the market

#### Innovations:

- The world's first additive pyrometer tool for firefighting gloves
- Precise temperature measurement from a distance
- Accurate temperature measurement in degrees Celsius and signaling via LED display
- Freedom of movement and action by attachment to glove
- Explosion and splash protection IP67
- Sustainable by rechargeable battery

#### Design aspects:

- Additive connection to protective gloves
- Ease of use and switch on by G-Sensor
- Perfect reading of temperature and signaling in case of danger
- Compact case with large radii to prevent snagging of dangerous points
- Shock resistant pyrometer and laser unit

The trend is certainly focusing towards quality products which are thinner and lighter whilst at the same time providing ever higher protective properties. The hand is the most universal tool of the human body and the one prone to the most injuries. The task of leading glove companies is to protect these in the best possible way at any time and in any situation, while ensuring an optimum freedom of action.

For more information, go to [www.seiz.de](http://www.seiz.de)

## SEIZ® XF C



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# Radiation. Don't run away from it! Train with it!

How can we better our understanding? How can we realistically train?

How can we have interactive challenging radiation training?



**Ross Smallcombe**

## An idea is born

Like any other day at the fire station, the daily equipment checks and maintenance were carried out first thing in the morning then through the door bursts a grinning Watch Manager with a bowl of folded bits of paper.

"Right, pick a piece of paper and then give the duty crew a five minute talk on the piece of equipment from the fire appliance," he says. As we worked through the pieces of paper it came to my turn, in went my hand, I opened my piece of paper and the watch managers grin widens.

I had the Rados RDS 200 Universal Survey Meter (radiation detector). I began with how the Rados RDS 200 is operated and its uses, including a confusing description of the types of radiation. I clearly needed to increase my knowledge of radiation and procedures around such a dangerous area.

▼ Many options for scenarios at the abandon village.

I decided the best way to increase my knowledge would be to put together a presentation about the Rados RDS 200 and a lecture covering radiation, and then to present this to the station crew. The biggest problem I found was being unable to carry out realistic training with the RADOS RDS 200 unless I could acquire some nasty radiation, which wasn't going to happen.

## Along Came Argon Electronics

I began collecting as much information as I could. I came across a company ARGON Electronics. This company specialises in CRBN (Chemical Biological Radiation Nuclear) Hazmat simulator training systems, supplying a very varied and comprehensive selection of simulators including the Rados RDS200 SIM. After visiting the Argon website I contacted them to enquire about the use of a Rados RDS200 simulator. Within an hour I was having a conversation with Steven Pike (Managing Director) who was willing to assist me with my plans and loan me



Ross Smallcombe is a Fire Fighter for Ryde Fire Station Isle of Wight. Starting his career as a Retained Fire Fighter in 2007 is now a Whole-time Fire Fighter based at Ryde Fire station since 2010. Before joining the Isle of Wight Fire and Rescue Service Ross worked in various areas including sales, teaching and mining/ranch work overseas.



▲ Simulation Training kit supplied by ARGON Electronics.

a kit which included simulation emitters (both directional and spherical), simulation powders and liquids, the GMP-11-SIM simulation beta contamination probe and EPD-MK2-SIM (personal dosimeters). This was fantastic news now I could plan a training package based on realistic scenarios, whilst evaluating this new equipment.

We are very lucky at our fire station because we have an old abandoned holiday village down the road which we have been using to train in many areas of rescue. The best way to describe this site is a mini Pripyat (town of the Chernobyl disaster).

## Off to Luton

I met Steven Pike at the Argon head office in Luton to collect the training equipment. After a brief explanation of my plans, Steven assured me that the equipment would be perfect, within an hour he had instructed me on how to set up the equipment including the emitters, beta probe, powders and liquids. This was all reinforced through practical application. Steven was extremely helpful and the simulation equipment was very easy to set up and use.

## Planning, searching, developing

Back at Ryde Fire Station on the Isle of Wight the task had really picked up momentum. I now had Ideas, various venues and simulation radiation detection equipment.

My first task was to design a lecture about radiation. At station we had input a few times on the subject of radiation presented by the Watch Officer, although very good and in-depth was too complex for people without a scientific background, such as me and the majority of my colleagues. This normally caused a lot of head scratching and confusion. The Watch Officer was of great help if I needed things explained. I stripped the subject back and began at its simplest, firstly creating a lecture about the Rados RDS 200, its uses within varied industries, what it detects, how to use it, construction etc. The second part was harder due to the massive subject matter that radiation covers. I created another lecture covering the basics of radiation. This included various types of radiation, dose rates, fire service procedures and a section covering Chernobyl and radiation levels around the disaster zone.

The two sessions were delivered to the station followed by a short practical hands-on session using the Rados RDS 200 SIM and GMP-11-SIM beta contamination probe. The gamma simulation emitters were turned on and beta liquids and

powders were used on food to enable the simulation detection equipment to show readings. This was the first time any of us had seen readings on the Rados RDS 200. With use of the dosage prompt card the firefighters could understand the levels of gamma radiation that they were receiving. With the GMP-11-SIM beta contamination probe attached, firefighters discovered which food items and drinks were contaminated. These combined sessions were a success with positive feedback and fire fighters now being comfortable with radiation readings and detection. The goal of delivering a session that gave a real understanding and hands on approach to radiation was achieved thanks to the RDS200.

## Practical training sessions

Now people had a better understanding of radiation and how to understand the readings on the RDS 200 we began to train using realistic scenario based training.

## Road Traffic Collision involving Radiation

This was set up to simulate a broken container with a source of radiation inside. Using a directional emitter, EPD-MK2-SIM (personal dosimeters) and RDS 200 SIM, a van was parked and a car was put into position to simulate a rear collision. The car contained a casualty that had leg entrapment. The crew needed to release the casualty and make the area as safe as





Image courtesy of Argon

contaminant powder was placed on various window sills, hand rails and flooring around an area of buildings. Teams had to find and then follow the trail to locate the lost casualty using the RDS 200 SIM and the GMP-11-SIM simulation beta contamination probe. Once again the simulation equipment proved invaluable and easy to train with.

#### Basic 'snatch rescue' involving arrival in the appliance

Basic scenarios was set up to simulate snatch rescue in various location and levels of buildings. Fire crews would drive towards the incident in the fire appliance and would start to receive radiation readings on the RDS 200 SIM. This was amusing to watch as fire appliances would casually drive down the road then stop all of a sudden and reverse back up the road. Big learning point – don't just assume you are safe in the fire appliance, positioning is very important. The distance that the emitters can transmit is impressive and allowed us to be very diverse in our training sessions.

#### Experience with Argon

Argon provided us with the perfect training equipment enabling us to learn and further our knowledge within the field of radiation. The simulator package they produce is designed to be identical to the radiation detection equipment carried on the frontline appliances. The simulation kit enabled us to train in a very realistic and practical way; the multi directional emitters were excellent enabling us to adjust strength and direction giving us options within the training environment. Being small they were easy to place anywhere and extremely easy to use. The simulation powders and liquids were a very valuable addition, allowing trainers to contaminate people, areas and objects such as food and consumable liquids, and small amounts were more than sufficient to gather readings.

All crews that were able to be part of the training sessions are now confident and competent with use of the RDS 200 and even became enthusiastic about radiation and training within this area.

We cannot thank Argon enough for their help, assistance and encouragement, as nothing can compare with realistic training in the fire and rescue service.

 **For more information, go to**  
**[www.iwight.com](http://www.iwight.com)**

#### ▲ Locating radiation source within a set of buildings.

possible, whilst keeping crew exposure to a minimum and within a safe working limit. The training session was completed and we were surprised at how long a simple task had taken to achieve. The de-brief was very thorough and points raised on how and why the training session had taken so long, and then to apply learning points to further scenarios/incidents.

#### School Laboratory accident

Set up within a building simulating a spillage of a radioactive substance. Using radioactive powder simulator, a RDS 200 and the GMP-11-SIM simulation Beta contamination probe, crews were called to the incident and would find that there was a walking wounded casualty within the building with contaminant on them also contaminant spilled within the building. This scenario enabled us to simulate wearing hazmat protective suits, source the radioactive substance, set up decontamination process and fill out all correct paperwork whilst having hands on practical use of radiation detection equipment. This scenario was carried out far better than the first, due to previous learning points raised and fire crews getting used to the equipment. Feedback during the de-brief being very positive once again towards the equipment.

#### Scenarios at the abandoned village

##### Finding safe routes

A casualty would be placed within a group of buildings, two radiation emitters were set up to simulate varying strengths and direction of radiation. Fire crews would then use the RDS 200 SIM to gather readings, log and report on varying strengths so that the Incident Commander would be able to map out safe routes through the buildings and area. The equipment worked excellently for this style of training incident due to its varying strength settings and multi directional abilities.

##### Hunt for the source

Radiation emitters were placed in various places around the abandoned village and crews in pairs were then sent off with the RDS 200 SIM and EPD-MK2-SIM (personal dosimeters) to locate the source of radiation, report back its exact location and how close they could get before they would receive over their acceptable dose rate. This worked very well and all crews were now very comfortable using these devices, finding the equipment a very beneficial tool to train with.

##### Casualty has run away from the scene

This session was designed to simulate a casualty covered with contaminant fleeing from the scene of a small radiation incident. Beta simulation radioactive

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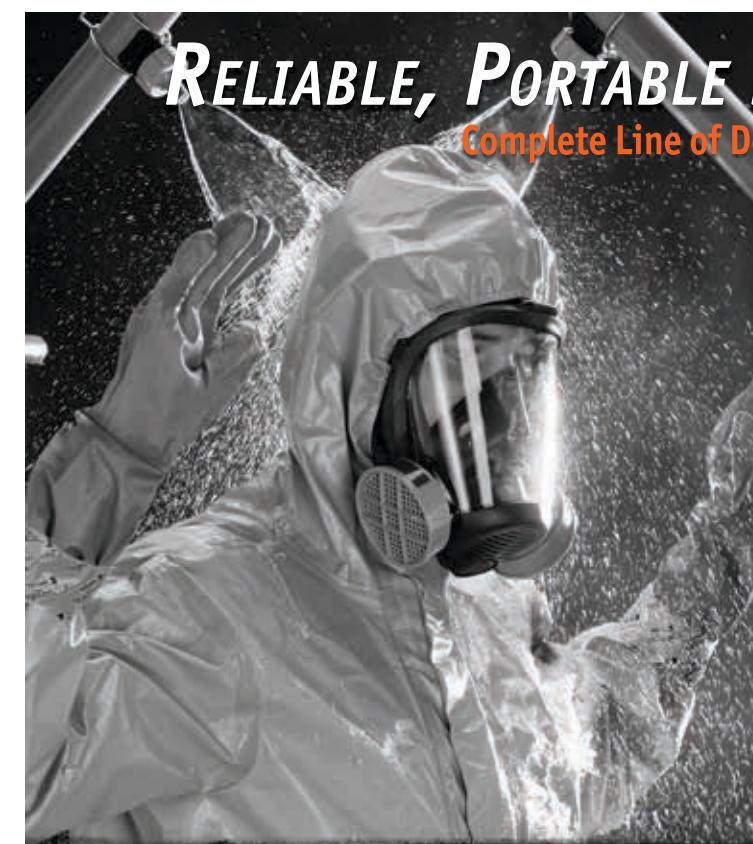
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## Liquid Natural Gas (LNG) training for first responders: Part 2

In Part One we discussed the First Responder training I provided for Jacksonville Florida. Their port will be re-fueling (bunkering) several vessels with LNG that will then travel back and forth to Puerto Rico. The class was informed that LNG is the same natural gas that is supplied to homes and businesses throughout the world. One of the differences is that this gas was converted to a liquid by cooling it to -260 F. At this temperature the liquid is considered a cryogenic which simply means extremely cold.



**Tom Guldner**

Tom is a retired Lieutenant of the New York City Fire Department's Marine Division and is a Principal Member of the NFPA Technical Committee on Merchant Vessels. His company Marine Firefighting Inc. is involved in consulting and training mariners and land based firefighters in all aspects of marine fire fighting.

**M**any of the properties that make LNG an excellent product also create hazards for First Responders. The extreme cold will freeze anything it comes in contact with. Remember, it is at -260 F. Most metals will become brittle when immersed in LNG. This could be the metal decks of the vessels that are bunkering or it could be the metal of your own equipment. Of course, human tissue will not hold up any better. Cryogenic burns resemble

the burns that firefighters are accustomed to. It is actually a frostbite type injury.

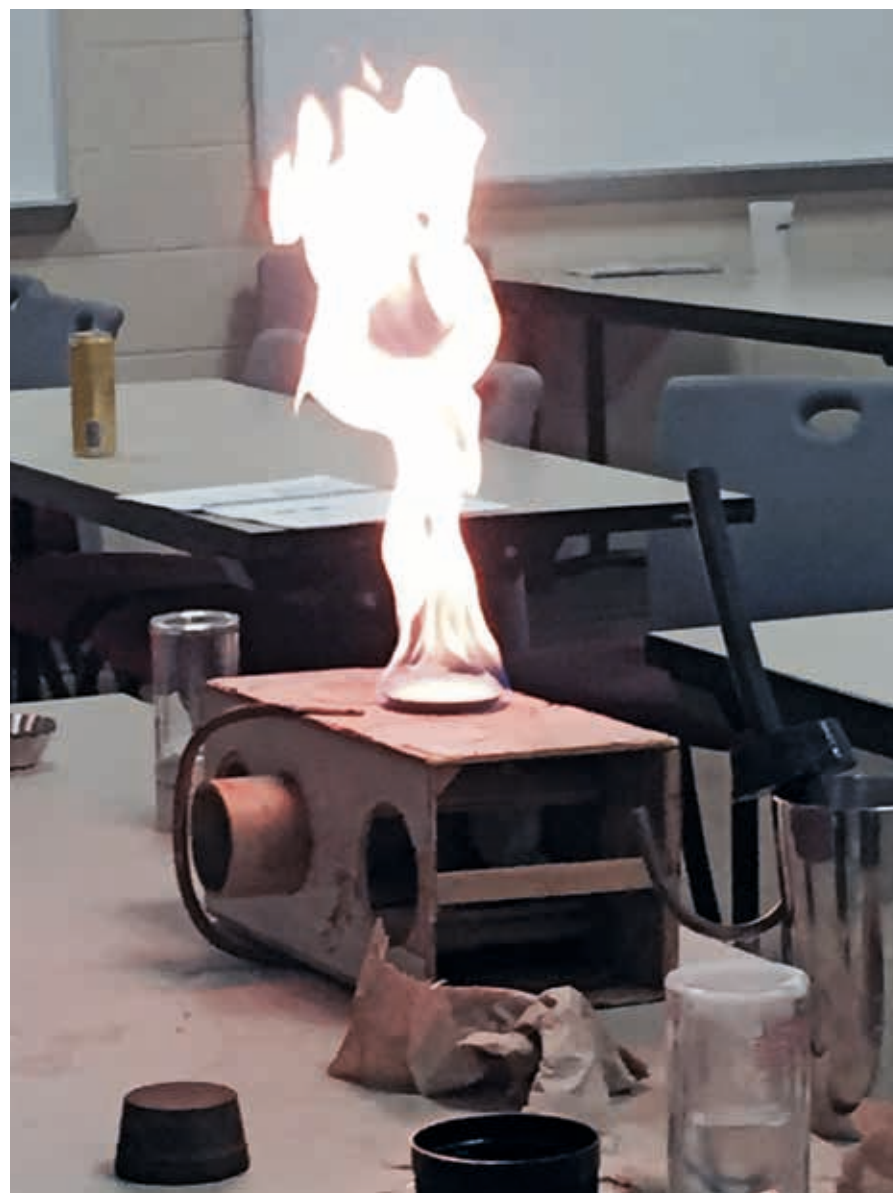
The class was informed that they were not expected to be close enough to any LNG spill to worry about these burns. In fact they were given specific instructions as to just how far they should stay from a spill. More about that later in this article.

The reason the gas is converted to a liquid in the first place is to reduce its size and make it cost effective to ship. When natural gas converts to a liquid its volume is reduced 600 times. In other words, if you wanted to ship natural gas overseas as a gas you would need 600 ships to equal the same amount of equivalent gas in one LNG ship. You can see that it would not be economically feasible to

▼ Cryogenic burns possible to unprotected tissue upon contact with LNG. Firefighters full PPE can protect against small splashes.







▲ LNG is almost pure methane and therefore burns with a “lazy” flame and little or no smoke. Because of this it also will burn hotter than many other flammable liquids.

transport the product in its gaseous state. In fact, prior to liquefying the natural gas it was considered a nuisance at oil wells. The gas could not be shipped in its gaseous form so it was just either burned off or released to the atmosphere.

But I was instructing a class of first responders! I needed them to know how to operate safely if there is an LNG emergency. I told them that many of the great benefits of LNG which make it beneficial to the marine community might cause problems for first responders. This volume reduction issue was one of those cases. If natural gas is reduced 600 times in size at it is converted into a liquid, what

happens if there is an LNG leak? For the first responder this means that the 600 number is reversed. Each gallon of LNG that is leaked will now expand to become the equivalent of 600 gallons of natural gas. I went on to say that there are many safeguards in place to prevent an LNG leak in the first place and also to drastically limit the amount of product leaked should there be an accidental spill.

Many of these safeguards have been used in the transport of LNG which has gone on safely for many years. All of the proven safety measures would now be instituted into the LNG bunkering process.

The process of converting natural gas into a liquid is called Liquefaction. One of the first steps in this process is to remove some of the many impurities from the gas. Impurities such as water, CO<sub>2</sub>, Propane, and others would freeze and thereby disrupt the liquefaction process.



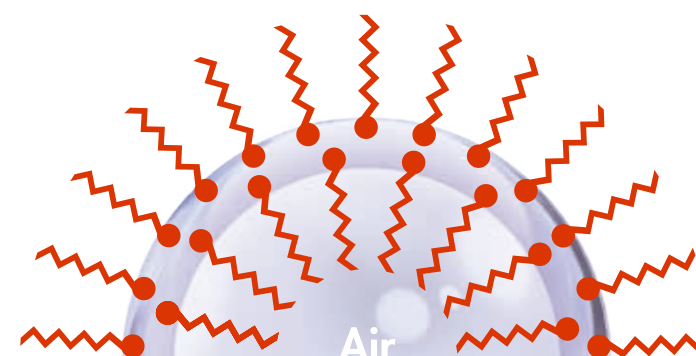
▲ LNG contact with common metals can cause embrittlement. Only stainless steel and high nickel content steel can be used in contact with LNG. First responders' tools and apparatus are at risk.

The end result is that, after the impurities have been removed, the LNG is almost pure methane. As I mentioned, many of the properties which are advantageous to the LNG industry may cause problems for the First Responders. Here we found another of those problems.

Due to the lack of impurities, an LNG fire will produce almost no smoke. To prove this we lit a small dish of LNG. Smoke is actually unburned products of combustion. LNG being almost pure methane is completely consumed by the fire. Because of this the flames from an LNG fire burns hotter than a gasoline fire and therefore gives off more radiant heat. Firefighters know that this radiant heat can mean increased risks to combustible exposures. These exposures will need to be protected. In fact, the LNG portion of a small leak or fire will most likely be over by the time of the arrival of First Responders. This does not mean that there will be nothing for them to do! Combustible exposures may still be burning and any injured will still need attention.

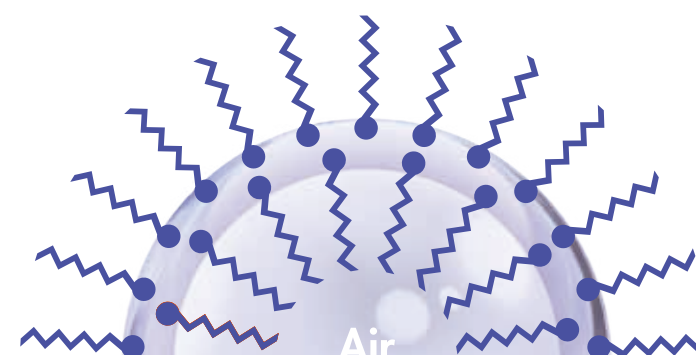
The class was also told that LNG is colorless and odorless. These same properties apply to the natural gas that will form when the LNG converts back to a gas. Many in the class questioned this. They were sure that natural gas did have a distinct odor. We are all familiar with the rotten egg smell that is associated with any natural gas leak at a private home

# Fatal Attraction



**Fluorine-free foam bubble**  
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● Hydrocarbon surfactant  
(Hydrocarbon tails are fuel-loving)



**Fluorinated foam bubble**  
AFFF Foam **repels** hydrocarbon fuels

● Fluorosurfactant  
(Fluorocarbon tails are fuel-hating)

## FORCEFUL F3 APPLICATION:

- Foam attracts fuel
- Foam becomes flammable
- Foam has reduced performance
- Foam use is increased

Need proof? See F3 foams on fire:



## FORCEFUL AFFF APPLICATION:

- Foam repels fuel
- Foam is NOT flammable
- Foam has superior performance
- Foam use is reduced

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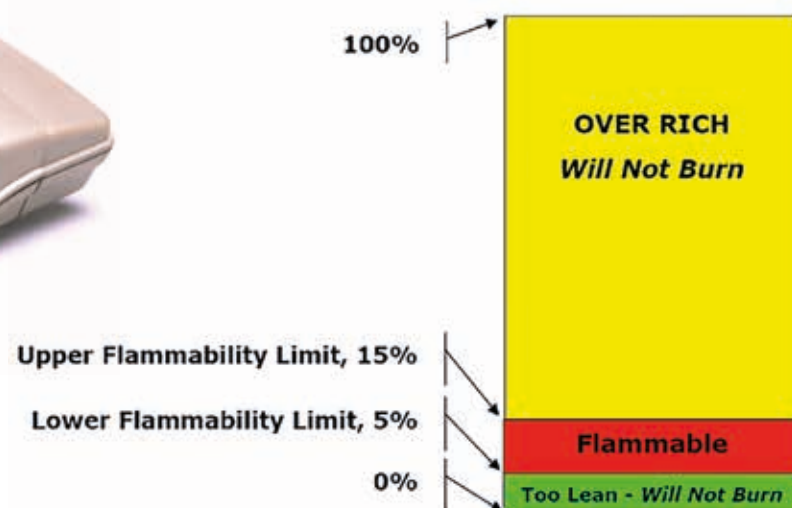
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FLUOROchemicals





▲ Natural gas from LNG has no odor and will only burn within a 5% to 15% mixture with air. First responder will need gas meters to determine the safe operating areas during an emergency.



or commercial building to which you customarily respond. That smell is not the natural gas! It is an odorizing agent that is placed in the natural gas as it leaves your municipal gas company on its way to homes and businesses. The odorant is added so that a natural gas leak can be easily detected. However, the odorant cannot be added to the cryogenic LNG and therefore will not be present in any LNG leak. Consequently, there will be no odor.

I mentioned that the LNG is not only odorless, it is also colorless. You may have seen photos of LNG training where there is a very visible white vapor cloud. What you are looking at is frozen water vapor, not natural gas. The colorless LNG is so cold that it immediately freezes any moisture in the air creating that distinctive white cloud. It requires that moisture be in the air in order to produce that cloud. In normal humidity areas it is said that the flammable zone will be contained within the visible cloud. (DON'T COUNT ON THIS!). In fact, for safety I would say, always assume that it is possible that the flammable zone could be outside the vapor cloud. I very rarely tell my classes to assume anything! I presented numerous photos and videos to show the class exactly what that white vapor cloud looked like. The class was also warned that they, **"DO NOT ENTER AN LNG VAPOR CLOUD"**.

Another property of natural gas is that it is lighter than air. When it rises into the atmosphere it is no longer a problem for the first responders. But that is for warmer natural gas. At an LNG leak, prior to it warming up to warm and toasty -77 C (-170 F), the colder natural gas will hug the ground. It will then travel down wind and, if it finds a source of ignition, it will burn back

to its source in what is described as a lazy flame. It will not explode in the open however, if confined, like in a basement, it may burn explosively. (Remember, it is natural gas!)

The class was informed that you cannot assume that this visible white cloud contains the boundary of any flammable vapors. Also, everyone in the classroom heard me state at least 20 times during the class that they **"DO NOT ENTER AN LNG VAPOR CLOUD"**. I don't even want you near the cloud. Immediately hands were raised in the class. "If the flammable portion is outside of the visible vapor cloud, how will we know that we are near the flammable vapor cloud?" My next slide showed some equipment that is already carried on many of the first responders vehicles that would answer this question. CGI or Combustible Gas Meters have been used by Fire Departments for many years.

The class was told to use their own meters so they would be familiar with them. (Always use your own equipment whenever possible.) I also said that they should go no closer to the leak than 10% of the Lower Flammable Limit (LFL) as indicated on the meters. That point should mark the start of your "Hot Zone". Again,....

**"DO NOT ENTER AN LNG VAPOR CLOUD"**.

Natural gas has a flammable range of 5% to 15% in air. This means that below 5% it is too lean to burn and above 15% it is too rich to burn. We want to keep any and all sources of ignition from coming in contact with that 5%-15%.

Many sources of ignition are obvious. An open flame, cutting and welding operations, lighted match etc. But there

are other sources of ignition you may be bringing with you. Your fire apparatus and vehicles have a internal combustion engine. Your portable radios, even the combustible gas meters we mentioned before has a battery which may create a spark if the unit is not intrinsically safe. Your fireboat or other passing vessels in the area may ignite the vapors if they get too close. No one should enter the area without a combustible gas meter and then go no further than 10 % of the LFL. And guess what, **"DO NOT ENTER AN LNG VAPOR CLOUD"**.

There were many more properties of LNG and tactics which were discussed. I am not able to cover everything that first responders need to know in this article. Remember, even if you are not located along the water you may still have to deal with an LNG emergency. As mentioned, buses, trucks, locomotives, and construction equipment may be powered with LNG in your response area. And don't forget, these vehicles will need to fuel up so you may have an LNG filling station along your roadways and rail lines. LNG may also be being transported through your district in tanker trucks and rail tank cars. You may want to consider some LNG training of your own!

At the end of the class, even with all of the hazards associated with LNG the participants were shown that if they are aware of the hazards and also aware of the tactics needed to mitigate those hazards then an LNG emergency can be handled safely. Knowledge and Training is the key.

And remember..... **"DO NOT ENTER AN LNG VAPOR CLOUD"**.

 For more information, go to [www.marinefirefighting.com](http://www.marinefirefighting.com)

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# What's New with... Personal Protective Equipment

With the greatly increased emphasis on firefighter safety, the leading manufacturers have boosted their research and development efforts to provide the end user with the safest, most efficient and reliable PPE. In this Buyer's Guide we highlight the latest offerings from the worlds leading suppliers.

## Armadillo Merino

Armadillo Merino® design kick ass socks to protect your feet in the heat of action however their latest innovation is even more cerebral. Recent focus has been on heads over heels to incorporate new yarns and garment features that will significantly increase head protection and user performance.

The new FR Balaclava is a very unique garment; it's a world first, as it combines a special superfine FR merino yarn with the latest in seamless technology in a balaclava that delivers superior safety and comfort to users. The new balaclava also draws on recent innovations in Formula One and the Special Forces community to create a remarkable balaclava that helps optimise wearer performance in high-risk environments. Better performance is achieved by being more comfortable with super soft next-to-skin comfort, no abrasive seams, less heat, less sweat and no smell.

Armadillo Merino® also offers a "tailor-made" program allowing the customized design of headwear to meet your specific PPE and helmet requirements. The FR Balaclava can also be colour matched to integrate with your existing PPE.

### Who is Armadillo Merino?

Armadillo Merino® cares. Armadillo Merino® designs and manufactures next-to-skin protective clothing specifically for the safety of professional operators. These technical garments are constructed for demanding environments using a range of high performance merino fabrics that deliver superior safety and comfort to wearers by exploiting the unique performance properties of merino fibre. Armadillo Merino® protects professionals operating in high-risk environments all around the world. Astronauts, special forces, military, SWAT teams, police, fire, ambulance, search & rescue, motorsports, heavy industry and other remarkable professionals wear Armadillo Merino® because they want to work safer, harder, faster, stronger and for longer.

For more information, go to  
[www.armadillomerino.com](http://www.armadillomerino.com)



## Ballyclare

Trust. Protection. Integrity. Qualities that make Ballyclare the number one choice in the firefighting sector.

Ballyclare is one of the UK's leading providers of protective clothing to the emergency services, military, transport and construction industries and when lives are on the line, second best simply won't do. We work closely with our industry experts and fire and rescue services themselves to create tough, safe, comfortable firefighter garments designed for maximum protection and maximum manoeuvrability.

From structural firefighting to USAR, technical rescue, wildland, High Volume Pump and line rescue situations, Ballyclare offers a comprehensive range to ensure firefighters stay safe, comfortable and protected.

We also offer a turnkey managed service solution that takes safety to a new level. We take on the responsibility for laundering and maintaining the garments and making sure they are fit for purpose and comply with health and safety standards. We maintain the exacting quality control product management procedures that allow every garment to be tracked and traced and finally decommissioned.

Key to the delivery of a fully managed service is state-of-the-art IT and Ballyclare continues to invest in the latest technology. Its bespoke Ballyclare ExtraServe portal provides customers with access to a garment service care system over the internet from anywhere in the world. Customers can log in to place orders, exchange deliveries, log queries or request replacement garments.

For more information, go to  
[www.ballyclarelimited.com](http://www.ballyclarelimited.com)

**BALLYCLARE**  
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## Bristol Uniforms

Bristol is an internationally recognised and respected designer and manufacturer of firefighter PPE. A pioneer of specialist protective garments in the UK, it now provides technically advanced head-to-toe firefighter protection to fire & rescue services in over 110 countries around the world through a network of experienced distributors.

Bristol's flagship design platform, XFlex™, provides the basis for structural, wildland and technical rescue garments. The XFlex™ structural range meets EN469 and offers outerlayer options in PBI and Nomex® fibres with Gore moisture barriers. RescueFlex™ is a technical rescue garment which meets General Flame standard EN11612 comprising a Kermel Hi-Visibility Red outerlayer with Gore Crosstech® SR moisture barrier. LayerFlex™ is the latest design offering which uses three garments in different combinations to achieve protective standards for structural and wildland firefighting and technical rescue operations. The RescueFlex™ jacket in combination with the XFlex™ trouser is for use in technical rescue or wildland firefighting meeting standards EN15614, EN11612 and High-Visibility EN20471. Wearing the XFlex™ outer jacket over the RescueFlex™ jacket provides protection for structural firefighting to EN469 Level 2.

Bristol also offers a range of its own design fire gloves and hoods and can supply complete head-to-toe PPE using carefully selected helmets and boots. All garments are bespoke and manufactured using sizing taken from individual wearers. Made-to-measure garments provide the best possible protective solutions and are available in a wide variety of fabric combinations.

For more information, go to  
[www.bristoluniforms.com](http://www.bristoluniforms.com)



## Bullard

Bullard, a worldwide leader in safety equipment for the fire service, designed its MAGMA Fire Helmet with input from firefighters around the world for the ultimate performance in fire conditions. The MAGMA's unique design and innovative features offer the individual firefighter the flexibility to configure a helmet to his/her exact requirements.

The helmet is available in two, lightweight, shell configurations: Type A Half-Shell or Type B Full-Shell. MAGMA's unique mask adapter design accommodates all of the leading brands of two point respirator masks and is spacious enough to accommodate spider style mask harnesses, as well. MAGMA also features

a three dimensional visor that covers the retracted front frame for a maximum degree of visibility in all directions. The helmet accommodates a variety of communications and lighting accessories.

The helmet provides firefighters with the maximum in performance in the difficult conditions of firefighting. The helmet's inner compartment is well protected from the heat, flames, sparks, and fluids that are part of daily firefighting activities. Designed to the requirements of EN443:2008, firefighters can have confidence in the MAGMA helmet.

For more information, go to  
[www.bullard.com](http://www.bullard.com)



## Dräger

Personal Protective Equipment (PPE) has come a long way since the early years of tough leather fire helmets from centuries ago. Our cutting edge products are in line with the changing demands of the UK market, where the complexities of modern industrialised life have introduced new hazards and materials burn hotter than ever before. We provide above-the-neck PPE products to an ever-expanding range of industries, not just the fire service – basically to any industry where employers need to protect their staff who work in hazardous environment.

There is a greater emphasis on more efficient, economical and effective performance. Dräger developed the first ever breathing apparatus more than 50 years ago and we have since undertaken decades of research and development, together with a stringent evaluation and assessment process, looking closely at the needs of PPE

wearers who face life threatening scenarios on a day-to-day basis. It is Dräger's belief that safety technology for anyone who needs to wear PPE in their equipment should make the job safer and more effective, as well as be lightweight and comfortable enough to allow them to concentrate on the job at hand.

In this climate of tougher safety regulations and economic cut backs, products are increasingly designed to withstand the test of time, keeping people protected year upon year with long service life and variety of applications – meaning that they are ultimately a cost effective solution and result in greater efficiencies at work. I am certain this trend will continue and that PPE will become ever more innovative – protective, safe, but streamlined and with the wearer's comfort in mind.

For more information, go to  
[www.draeger.com](http://www.draeger.com)





## DuPont

A commitment to safety is a defining part of the DuPont culture. Through our continued commitment to innovation and personal protection, DuPont together with its partners has developed an extensive line of fabrics targeting the needs of first responders and first receivers.

Why are Nomex® and Kevlar® fiber an ideal choice for firefighter apparel?

When exposed to extreme heat, Nomex® undergoes a special reaction, changing its properties to capture more energy in the fabric, helping to give the wearer valuable extra seconds of protection from heat transfer.

Garments made from Nomex® fiber can last two to three times longer than most other high performance protective fabrics. Per garment manufacturers, the average wear life of Station wear made of Nomex® is about five years, and it can be washed and worn at least 125 times, making it an affordable choice.

Kevlar® is lightweight, durable and extraordinarily strong. Best known for its use in ballistic and stab-resistant body armour, Kevlar® continues to evolve into fire fighter fabric applications and allows heroes to be heroes.

Next to the outstanding ENDURANCE, Nomex® fabrics reinforced with Kevlar® are available in many fabric constructions and COLOURS and cover the entire spectrum of lightweight and comfortable fabrics needed by the modern firefighter.

Our latest Nomex® Nano and Nomex® Nano-Flex materials are nearly 40% thinner than most advanced flame-resistant (FR) materials used for thermal liners today, offering greater mobility, breathability and particle barrier without sacrificing protection.

For more information, go to [www.dupont.com](http://www.dupont.com)



## Duram Mask

Duram Mask is a leading developer and manufacturer of respiratory protection systems, specializing in high-quality compact safety solutions. The company makes substantial investments in R&D, which has yielded several globally recognized patents, and it offers products adhering to rigorous international quality standards. Its design philosophy is geared towards making equipment which can provide optimal attainable protection, constantly striving to create more compact masks while improving their protective capabilities.

The masks are made from light and durable materials, are one-size-fits-all, and are easy to unpack and wear. They are small enough to be comfortably carried on one's person throughout the workday, making them easily and immediately accessible in times of emergency. Additionally, their compact design makes it possible to place them in

many strategic locations in the workplace without creating an obstruction.

Duram Mask delivers tailor-made solutions to its customers, with lines of solutions designed for different scenarios such as fires, chemical spills, and release of chemical or biological agents, allowing wearers to evacuate the scene safely and calmly and even assist others. The hoods provide several options and levels of protection against organic, inorganic, and acidic gases, as well as against ammonia and carbon monoxide, making them suitable for various industries and sectors, including chemical and petrochemical plants, mines, oil and gas installations, military and law-enforcement agencies, emergency services, hospitals, hotels and high-rise buildings.

For more information, go to [www.durammask.com](http://www.durammask.com)



## Globe

Fighting fires is demanding, physical work requiring maximum athletic performance.

The fact is, if you want to perform like an athlete, your equipment has to enhance your performance. Your gear should move the way your body does, without restriction. And, of course, it must protect you.

It's more than turnout gear. It's athletic gear for firefighters.

Globe's G-XTREME® 3.0 is completely retailored from collar to cuff to provide unrestricted mobility for even the most athletic firefighter. With all the features that made the original America's most popular gear, including Globe's exclusive AXTION® Back, Sleeve, Seat, and Knee, you'll instantly feel how these improvements let you make all the right moves. And, like the original, G-XTREME® 3.0 comes in SHAPES to fit you better.

Globe also has its own factory that is dedicated to manufacturing athletic-construction firefighter boots. All Globe boots share the remarkably flexible platform, cushioned and contoured sole, and internal fit system that make Globe boots fit better, grip better, and feel broken in right out of the box.

For more information, go to [www.globeturnoutgear.com](http://www.globeturnoutgear.com)



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### Goliath Footwear

Goliath Footwear invite UK and international fire crews to try their latest technical footwear developments, the YDS Apollo Wildland Rescue Boot and the YDS GORE-TEX® Pyros Rescue Boot designed to meet a diverse multi-task rescue role.

The YDS Apollo Wildland Boot F2AR1352 is one of the latest revolutionary boots from Goliath Footwear. Suitable for wildland fire conditions, the lightweight 8 inch rescue boot is designed for cool comfort with implemented TenCate® flame retardant and water resistant textile panels, an advanced breathable alternative to all-leather. All YDS fire boots feature the original injected DDR technology produced by the ISO9001 quality assured factory, which delivers a tough rubber outer sole to protect from nicks and cuts and 300°C heat, and an air injected rubber mid-layer provides a cushioned comfort for the foot. The 'Rubber / Rubber' sole material combination provides the optimum protection in hazardous and hot environments. Together with a lightweight aluminium toe cap and protective textile midsole the combination offers a uniquely lightweight and flexible



protective boot for wildland fire fighting. The YDS GORE-TEX® Pyros F2AR 1354 is an 8 inch quick release rescue boot ready for action. With its breathable and waterproof GORE-TEX® membrane the wearer can comfortably work in adverse weather and environmental conditions and feel warm and dry. Combined with an injected DDR sole unit, aluminium toe cap and flexible textile protective midsole the GORE-TEX® Pyros is the ultimate rescue boot fit for the modern fire and rescue role.

In-house SATRA testing ensure all YDS fire boots meet the high standards of fire crews around the world, with their range independently tested to meet the current European and Australian firefighter safety boot regulations.

For more information, go to [www.goliath.co.uk](http://www.goliath.co.uk)

### Kermel

Everyone is aware of the high protection levels required by the modern day Fire Fighter and many suppliers including KERMEL have a solution to fit the needs of the end user. The question is 'do we do enough to help the after sales effect?'

What is in place to protect the budget costs of the different Fire Fighter organisations and what about looking at any impact we have on the environment regarding sustainable development?

At KERMEL we treat all aspects very seriously. We aim to ensure that not only do we maximise the wearer comfort with low heat impact on the human body but we also want to make sure that the cost of ownership to the brigade is as cost effective as possible.

The latest Kermel® product on the market is the true 'no breakopen' KERMEL B fabric. This fabric was developed to ensure continued

professional looking aspect with little to no shrinkage even after 30 industrial wash/dry cycles. Not only then is there a benefit with initial lower cost but the lifetime of the garment is extended to reduce owner costs.

KERMEL also have in place a sustainable development project whereby old garments no longer in service can be collected and recycled for use in other areas where heat and flame are a risk.

#### Key properties

- Highest level of fire fighter protection
- No breakopen fabric
- Excellent wash durability resulting in 'much' lower owner costs
- Environmentally responsible program in place

For more information, go to [www.kermel.com](http://www.kermel.com)



### MSA

At MSA, safety is what drives us every single day. Our goal is to provide our customers with dependable, high-quality safety solutions to help ensure a safe return home at the end of each work day. Established in 1914, MSA Safety Incorporated is the global leader in the development, manufacture and supply of safety products that protect people and facility infrastructures. For more than a century now, MSA has been working closely with firefighters to develop the best self-contained breathing apparatus (SCBA), state-of-the-art head protection systems, sophisticated monitoring systems and thermal imaging cameras as well as innovative portable gas detectors which are all setting standards.

Firefighters equipment needs to be especially rugged and reliable for battling the toughest conditions while allowing highest possible ergonomic freedom at work - and they're the backbone of why we can proudly say that MSA is "The Safety Company".

Structural firefighting in buildings is certainly one of the most dangerous and challenging jobs. Beside that First Responders and Emergency teams fight open space fires and must deal with rescue operations, hazmat interventions or road traffic accidents. All these and various more incidents require a broad range of skills and best-in-class equipment that support and secure their work.

Our assortment for the Fire Fighting segment delivers a broad range of solutions:

- SCBA – Self Contained Breathing Apparatus
- Closed Circuit Breathing Apparatus
- Head Protection Systems
- Fall Protection for SCBA
- Portable Gas Detection
- Monitoring Systems
- Thermal Imaging Cameras
- Escape Devices

For more information, go to [www.msasafety.com](http://www.msasafety.com)





## PAB Akrapovic

PAB Akrapovic is specialised in developing and manufacturing high-tech protective helmets and different personal protection equipment. Our goal is to ensure ultimate protection considering the highest safety standards, best materials and finest technology.

Our range of products covers the needs of a wide range of professionals – professional fire fighters, wildland firefighters, technical rescue services and EMS activities. With different specifics, certificates and a wide range of accessories, you can choose and customise the most suitable safety helmet for your professional needs. Our main portfolio includes helmets for structural firefighting, outland and wildland firefighting, rescue activities and industrial protection. All our products conform to EN standards and are produced at our facilities in Croatia.

Our helmets offer a perfect combination of functionality, resistance and aesthetics. Superior fiberglass composites or heat resistant thermoplastic ensure ultimate resistance to extreme temperatures and other work or rescue related conditions. A lightweight shell with ergonomic shape provides great comfort for the wearer. A wide range of accessories enables a high level of personalisation for each customer.

Structural firefighting series helmets are EN443:2008, EN14458:2004, EN166:2004 certified and MED Approved. The outland firefighting and rescue series are EN16471:2014, EN16473:2014, EN166:2004 certified.

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## PBI Performance Products

PBI fabrics are the first line of defence on the fire ground. They are renowned for their unique combination of flame resistance, durability and comfort, which is why they are first choice in protection for the most extreme conditions, from NASA's astronauts, to emergency responders, the military and Formula One drivers.

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 For more information, go to  
**[www.texport.at](http://www.texport.at)**



Teijinconex for its superior properties, but the protective workwear market confirms that this material delivers the highest level of protection combined with superior wearing comfort. In view of our customers' requirements, Teijin now also offers an easily dyeable fiber: Teijinconex neo. This new fiber enables customers to produce tailored workwear in different company colors.

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and fit with the durability and performance of military footwear. We also offer the widest range of professional safety helmets, our new F10 MkV Pacific Helmet provides the ultimate in lightweight, comfort and safety. It's jet-style design ensures that the F10 MKV is not only functional but looks good too.

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Every day, firefighters around the world risk their lives to protect the property and lives of others. As these brave men and women place their lives in harm's way, PBI fibres play an integral role in firefighter safety. High performance outer shell fabrics with PBI fibres provide essential protection from heat and flame. PBI outer shell fabrics are EN and NFPA approved, and will not shrink or become brittle when exposed to high temperatures. PBI fabrics deliver high levels of comfort and durability. Choose from PBI Gold®, PBI Matrix® or our newest arrival, PBI Max™. For detailed technical information regarding PBI products, contact us directly at [international@pbiproducts.com](mailto:international@pbiproducts.com).

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# Making the attack positive

Positive Pressure Attack (PPA) is a useful tactic to have for structural firefighting. Before we get into the discussion of the when and how to use PPA we should make sure we have a clear definition of what PPA is. Positive Pressure Attack is the coordinated tactic of applying Positive Pressure Ventilation (PPV) during an offensive interior fire attack. Before PPA is used as a tactic, personnel should be familiar with their SOP's/SOG's on using PPA for structural fire control.



**Christopher Pence**

Christopher Pence is a 20 year veteran of fire and emergency services currently serves as a Fire Apparatus Operator for the one of the busiest fire departments in the nation, DeKalb County Fire Rescue in Atlanta, Georgia. He is a graduate of Columbia Southern University (CSU) with an Associates of Fire Science Degree. Before beginning CSU, FAO Pence obtained a Paramedic certification along with many other state and national rescue, fire, and leadership certificates. He has a passion for teaching others through classroom sessions and real life scenarios.

Using safe procedures are needed to maximize the safety of both fire personnel and victims during offensive firefighting operations. PPA can be used when the need for an aggressive fire attack is needed to stabilize the incident.

To understand how PPA will assist the fire crews by changing the natural flow path of fire within a structure. Once firefighters have moved into position and open the door to make entry, attack crews will change the flow path of the fire. Fire will now move towards that opening because the pressure that is created in the fire compartment is higher than the pressure found outside the compartment. This means that when firefighters enter the structure they are now in the flow path of the fire, bringing all the

products of fire towards interior crews. Any victims that are between the fire and the entry point will now be subject to additional heat and smoke conditions. Firefighters can improve these conditions by using PPA. A positive pressure attack will change this flow by increasing the pressure at the entry point. Giving the products of combustion a controlled path to the exterior of the structure.

Now on to the benefits of using PPA. Positive pressure attack rapidly removes the products of combustion, making it easier and safer for crews to advance to the fire compartment. The fire's ability to spread is reduced because the heat and smoke (which are fuels) are removed from the structure. Search and rescue efforts are helped because visibility is improved making it faster to search areas of the structure. Victims now have clean cool air replacing the fire gases, increasing the

▼ Crews ensuring the PPV fan is properly placed before entry.



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Image courtesy of Christopher Pence

▲ Ensuring the exhaust opening is clear of any obstructions before the PPV operation starts.

chance of survival. Last, PPA can help to reduce damage caused by heat and smoke.

The procedures to make a positive pressure attack can vary from department to department but they should include some of the same basic tactical procedures. The first step in using a PPA for your attack method is to determine the entry point for the fire attack team. This entry point should be on the unburned side of the structure and is where both the attack and ventilation teams are to enter. At this point, a firefighter should be assigned to get and operate the positive pressure ventilation fan (PPV) during the operation. Once the PPV fan is brought to the opening it should be started, turned away from the building and left idling till the command calls for PPA. As the officer-in-charge performs their 360 they should determine the best exhaust point. This should be as close to where the fire is as possible. A team is now directed to be in charge of creating the exhaust point and wait for command to call for it to be opened. The team should also be equipped with a hose-line if there are exposures. Once the fire attack team is in place with a charged hose-line the exhaust opening can be made. The entry door should be opened

and the PPV fan placed into position. The PPV should be placed in a position that the fan produces a cone that encompasses the opening. The fire attack team should wait to enter until they see a change in conditions (this normally only takes a few seconds). If fire intensifies in the ceiling at the entry point, this is a sign that a catastrophic fire event may occur and the use of PPA should be stopped. This can be an indicator that the exhaust opening is too small or that there is an opposing wind. Once the fire is extinguished, overhaul should be immediately started due to the danger of the fire reigniting due to the use of the PPV fan supplying additional air to the fire room. The use of thermal imaging cameras is strongly suggested as part of any overhaul.

The following are some of the tactical considerations for the use of PPA. The size of the exhaust opening is very important to ensure the products of combustion are exiting the building and that the PPV is not just increasing the size of the fire. The exhaust opening should be between half to twice the size of the inlet opening where the PPV is placed. If the exhaust opening is too small, a flashover could occur and if it's too large the products of combustion will not exit the building effectively. Ensure that ventilation openings are controlled. Do not allow for several openings to be made in the structure because you will not be able to

pressurize a structure which has had the multiple windows removed. Do not let fire personnel block the flow path of the PPV. Doing this will only reduce how effective the fan will be.

### Dos and Don'ts of Positive Pressure Attack

#### Do

- Use windows for exhaust openings. Using a door could bring heat down to the floor level causing victims to be burned.
- Perform PPA from the unburned side of the structure.
- Ensure communication is clear on when to direct the PPV into the structure.
- Ensure that the exhaust opening is open before the PPV is directed into the door.
- Watch for worsening fire conditions. If conditions start to get worse then back crews out of the structure.
- Wait approximately 10 seconds before entry is made to see what fire conditions do.
- Be prepared for the fire to exit the exhaust opening. The need to place an exposure line at this opening may be a consideration to protect exposures.

#### Don't


- Don't use when signs of backdraft.
- Don't use when victims are hanging out of windows waiting for rescue.
- Never enter under thick, turbulent black smoke, this is a sign of flashover.
- Never have an exhaust opening where a strong wind could blow from that side.

So in summary, positive pressure attack is a useful tool for any fire company to use when it is used correctly. Positive pressure attack can be an effective tool for increasing the survivability of victims in a structure fire. Fire attack crews will notice that not only is it a cooler but they will also have increased visibility. A strong command presence is needed due to multiple activities being performed at the same time. As with any other job performed on a fire scene, positive pressure attack should be performed in training before it is used at an emergency scene.

➔ For more information, go to [www.wiits.training](http://www.wiits.training)

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# Multi-agency (Integrated) CBR capability

The importance of multi-agency collaboration during major events cannot be underestimated in this world of terrorism and hazardous substances emergency agencies need to train to the same standards and continually exercise their skills. It is not just the formal interaction that is important the informal knowing of individuals across agencies ensures a safer community. This is what the Victorian emergency services are doing in Australia.



Peter Lucas

## Victoria, Australia

Located at the south east corner of the Australian coast is the state of Victoria. Being Australia's second-smallest state, Victoria covers 227,600 square kilometres and has a population of nearly six million people. In comparison, Victoria is roughly the size of the British Isles or slightly larger than the US state of Utah.

## State CBRNe arrangements

Although small in area, Victoria has the second largest population. As such, Victoria has the largest number of persons per square kilometre. To this end, Victoria has been proactive in its approach towards combatting:

- Hazardous material (HazMat) incidents and consequences and also
- Chemical, Biological, Radiological, Nuclear and pre-cursor explosive chemical (CBRNe) incidents and consequences.

In being proactive Victoria has established:

- A CBRNe sub-committee that is responsible to government for providing appropriate arrangements to reduce the impact of CBRNe incidents by leading:
  - Agencies
  - Communities and
  - Individuals.
- A formal strategic plan and also
- The authority for an agency to have total control of the incident. Primarily this authority is provided to either, or both of its combatting agencies, being the:
  - Metropolitan Fire Brigade (MFB) and
  - Country Fire Authority (CFA).

▼ Members of the Victoria Country Fire Authority with Police and Ambulance personnel at a CBRNe training session.



Peter Lucas has been a firefighter with the Country Fire Authority since 1976 and has been awarded the Australian Fire Service Medal. In this time Peter has been specialising in multi-agency relationship building.





Image courtesy of Peter Lucas

▲ Members of the Fire (MFB) and Police service returning from the Hot Zone, processing evidence at the 'Evidence Table'.

Furthermore, Victoria is also able to draw on its:

- Police Service (Victoria Police Force – CBR Unit)
- Department of Health – (Radiological Incidents & Health consequence)
- Ambulance Service (Ambulance Victoria [AV]) and
- Federal agencies and departments.

In addition and if required, the State Emergency Service – Victoria (SESV) is also able to assist any of the above agencies through providing additional rescue equipment for use in a Hot Zone (HZ) and also trained ancillary personnel in the Cold Zone (CZ).

In appreciation of the above arrangements, a further requirement of the CBRNe Sub-committee is to ensure that all agencies will:

- Work together;
- Use resources efficiently and effectively; and
- Ensure a seamless approach to all aspects of CBRNe incident management.

### Operational planning

Although the command, control and coordination of multiple agencies at a single incident may appear confusing and complex, the use of Victoria's emergency management arrangements provides clarity, efficiency and effectiveness.

To ensure the success of a multi-agency attendance at a CBRNe incident, combined annual training is undertaken by CBRNe Specialists from the aforementioned agencies. This combined annual training is appropriately funded through a separate government training budget and the training drills are designed and facilitated by the state CBRNe Training Working Group.

Although these skills enhancement and training drills address casualty management, a strong emphasis is placed on the:

- Pre and post medical monitoring of all CBRNe Specialists who enter and leave the HZ and warm zones (WZ);
- Injury management of CBRNe Specialists within the HZ and WZ whereby the operator (notionally):
  - Is unconscious
  - Is suffering a severe fracture
  - Has a safety breach of PPE

- Is conscious and able to self-treat and manage the situation
  - Any combination of the above.
- Familiarity and refresher training with:
    - Radio communications (Single channel – multi agency system)
    - Nomenclature and abbreviations
    - Other agencies:
    - Breathing apparatus (BA)
    - Detection and monitoring equipment
    - Rescue equipment (Sked™ and Ferno™ etc)
  - Decontamination of:
    - Emergency personnel
    - Mass decontamination
    - Tools and
    - Evidence.
  - Opportunity for scientific advisors to convene and provide united advice to the Incident Controller and CBRNe Specialists.

### Continual improvement

To further assist in the continual evolution of Victoria's CBR capability, CBRNe Specialists from the aforementioned agencies are provided the opportunity to:

- Complete a state accredited CBR Incident Controllers' course
- Complete a nationally accredited CBR Operators course
- Train with CBRNe Specialists from the:
  - USA
  - UK and
  - Canada
- Receive a research scholarship through the Emergency Services Foundation (ESF).

### Exercising Victoria's CBRNe capability and capacity within the Counter Terrorism environment

During May 2012, Exercise Hades 12 was conducted in order to test National and jurisdictional interoperability, capability and capacity to execute mass fatality arrangements within a CBRN environment. The primary scenario of this exercise involved the (notional) release of a chemical agent on board an inbound flight thereby causing the (notional) death of 12 passengers and medically affecting a further 18. On arrival at Melbourne Airport the flight was received by all of the above mentioned agencies and also Airport Firefighters from Air Services Australia. Throughout the 12 hour exercise:



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Image courtesy of Peter Lucas

▲ Members of the Victoria Police performing rescue drills for an 'Operator Down' under the instruction of an MFB firefighter.

The passengers were:

- De-planed and scrutinised
- Decontaminated
- Triage.
- As the lead agency, Victoria Police was able to remain within the HZ to test its:
  - Forensic (Crime Scene) processes within a contaminated environment
  - Disaster Victim Identification (DVI) processing of contaminated cadavers
  - Prioritise the evidence and intelligence that was to be extracted from the contaminated environment.
- Both the MFB and CFA were able to test their capability and capacity in relation to:
  - Providing BA support to the Victoria Police
  - Providing mass decontamination to
  - Passengers
  - Tools
  - Evidence / intelligence

- Provide scientific advice in relation to the
  - Management of the CBRNe agent.
- Ambulance Victoria (AV) was able to test its capability to
  - Assess / triage patients within a HZ
  - Treat patients within a HZ and
  - Process the patient through decontamination (WZ). As a result of Exercise Hades 12,
- Victoria had identified its capability and capacity to manage a CBRNe incident (within the aviation environment) that involved the processing of mass casualties
- A total of 11 key recommendations were provided to the national counter terrorism committee.

#### Multi-Agency operational deployment

Annually and under the guidance of qualified chemists, the Victoria Police CBR Unit will attend numerous illegal (methamphetamine) chemical laboratories. The purpose for the police attendance is to:

- Prevent the (illegal) manufacture of methamphetamine

- Safely decommission the laboratories
- Rehabilitate the environment back to a level of safety
- Gather evidence / intelligence
- Prosecute those offending.

Due to the dangers associated with illegal methamphetamine laboratories, the CFA and or MFB often assist the Police in providing:

- A firefighting capability
- Rescue capability and / or
- Monitoring and detection capability.

On Sunday the 10th February 2014 the roles were reversed whereby the CFA called on the assistance of the MFB, Victoria Police and AV in order to convene a multi-agency Rapid Intervention Team (RIT) within a contaminated environment. The circumstances for the deployment of an RIT involved an out of control, complex fire within an open-cut brown coal mine at Hazelwood, Victoria.

Initially ignited from a series of smaller fires, the Hazelwood fire burned for a total of 45 days. During this 45 day period at least 20 to 30 members of the CFA and MFB were continuously rotated into the mine to fight and control the fire.

Due to the constant presence of carbon monoxide (CO)\*, firefighters were required to monitor levels of the toxin, and to operate in self contained breathing apparatus (SCBA) at pre-determined trigger points.

Fire fighting crews were supported by MFB and CFA hazmat technicians with advanced monitoring equipment, and RITs in the event of serious injury or illness.

Although the RIT was not deployed in an operational capacity, it did come together, practice and was ready to conduct rescue operations within the open-cut mine.

#### Conclusion

Due to having a strategic plan that is adhered to, coupled with an adequate training budget and annual combined training, Victoria, (Australia) has a CBRNe capability that has the capacity to perform over an extended period.

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# Offensive fire attack – Variables that interfere with the fire gases outlet: Part 1

Offensive fire attack, or transitional attack, is an increasingly technique used in Fire Services around the world with some differences based on the degree of training and the equipment used. That is why we have set out to analyse the variables that can improve implementation, application and effectiveness.



Pablo Boj

Pablo Boj is a professional firefighter in Malaga Fire Department (Málaga, Spain) since 2002, and crew commander since 2008. Pablo holds a degree in Criminology and his work has been focused on the field of fire investigation and fireground tactics.

**T**he offensive fire attack technique aims to reduce fire power by directing a straight stream of water against the ceiling of the room on fire from outside. With this form of projection, the gas flow dynamics of the fire are minimally affected due to two factors. On the one hand, it prevents blocking the exhaust by using a straight stream and, on the other, it generates less vapour than with the application of fog pattern water, affecting the gas layer and its dynamics as little as possible, thereby not jeopardising the survival conditions of potential victims nor endangering the fire-fighting teams as they advance further into the building.

The choice of hose diameter is one of

▼ The angle and speed of the water jet condition the water dispersion pattern and droplet size.

the first decisions to make after assessing the incident, but this decision can have major consequences for Fire Services which are accustomed to the use of 25 mm water lines at high pressures to increase flow, as opposed to lines with a greater diameter working at lower pressures.

The variety of options available creates the need to assess which line is recommended for this technique, as well as the factors which influence their effectiveness. The aim of our trials is to determine the influence of the variables in relation to the type and position of the installation to interfere the fire gas coming out, the way in which the water is dispersed inside, and to where and under which conditions it is more efficient to aim the water. In this article we will focus on the variables that can interfere with escaping gas.



Image courtesy of Pablo Boj

## Drag cone effect on the outlets

As we know, if we project a water fog pattern at a outlet, the flow of water and air will block the fire gases coming out, reversing the flow of gases by pushing them inwards, thereby aggravating the survival conditions.[1] Any water stream drags around the jet and coaxially an airflow due to friction with the water, which we can call "drag cone". To interfere as little as possible with the fire gas flow path coming out of the exhaust where the water is being introduced, either by the jet of water itself or by the drag cone generated, we use a straight stream. This type of stream, on moving away from the nozzle, gradually opens out due to the dispersion effect of the water body as a result of the friction with the air, also increasing the size of the drag cone. In this equation, friction is proportional to the square of the stream speed, configured as the key variable, so the system pressure and the speed with which the water leaves the nozzle play a fundamental role in the formation of this drag cone and in the interference that causes in the outlet at a given distance.

The angle at which the stream enters the window is another variable to be considered, as the interference with the fire gas flow path is lower the greater the angle at which the water enters the horizontal plane. The hose operator can see how the visible surface of the window (and thus the area available for the air inlet) is smaller the closer he stands to the façade. Furthermore, the pressure of the airflow into the room (on X axis) is less because the angle of its movement is greater.

## Trials conducted

To approach these issues, it is not necessary to have sophisticated measuring devices, but decent ones are required to make comparisons to tell us whether our hypotheses are correct or not.

Two trials were designed and repeated with different configurations in a multi-storey building constructed specifically for firefighter training at the Málaga Fire Service. The variables for the hydraulic system were:

- Pump pressure. A Rosenbauer NH30 centrifugal pump was used. The pressures used were 10, 20 and 30 bar for the 25 mm hoses and 5 bar for the 45 mm ones.



Images courtesy of Pablo Boj

▲ A high pressure water straight stream drags a cone of air that can interfere with the gas outlet.

► Knowing the behavior of the water stream inside the room and the effects on the gas outlet will help to apply the technique more efficiently.







Images courtesy of Pablo Bog

◀ Measuring air flow generated by the straight stream.

## Trial 2

This involved estimating the flow of water from the different configurations by measuring the projection time of a known amount of water.

## Findings and discussion

The results of trials 1 and 2 are shown in the table below. The data provided by the results confirm the baseline scenario, verifying the following statements:

- The higher the pressure in an installation and the output speed of the water, the greater the airflow dragged into the room.
- The closer we stand to the façade, the lower the airflow dragged into the room.
- Pressure has more influence on the drag cone than the actual water flow.

The data obtained shows that, when deciding how to apply this technique, it is preferable to use hydraulic installations with a larger diameter at a lower pressure and that the operator stands as close as possible to the façade within security conditions in order to interfere with the fire gas flow path as little as possible.

In the next article we shall discuss issues related to water dispersion inside the room and vapour generation.

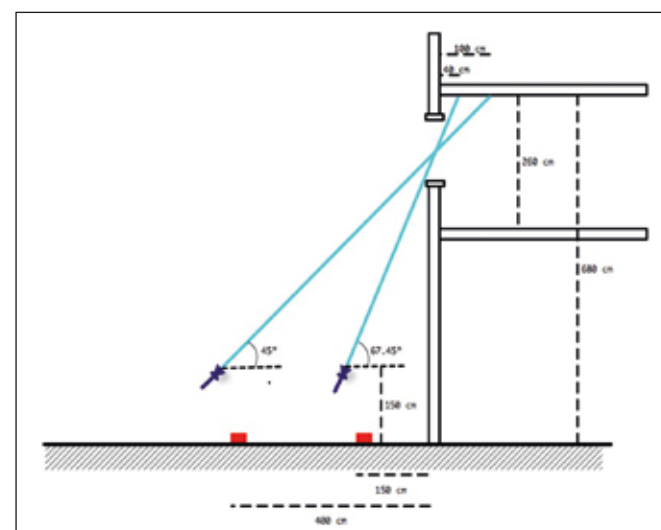
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- Nozzles. Three Firestar devices were used: two 25 mm models with maximum flow rates of 150 L/min and 230 L/min, and one 45 mm model capable of delivering up to 475 L/min, which was used with the flow meter positioned at 360 L/min.
- Position on the façade. Two projection positions were set from the ground, perpendicular to the window, placed at a distance of 1.5 and 4 metres from the façade.

## Trial 1

This was conducted in a room on the second floor with all openings closed except for the projection window and a known surface outlet. From the outside a straight stream of water was aimed at the window, whilst the output speed of the air through the exhaust was measured by an anemometer to determine the airflow, which allowed us to estimate the amount of air that had entered due to the effect of the stream projection. It should be noted that the site was not completely sealed, with there being the normal space between the frames and sashes of windows and doors.

▼ Scheme with the measures of trial 1.



Config.	Pump pressure	Hose diameter	Nozzle nominal flow (L/min)	Actual water flow (L/min)	Air flow (L/s)	
					*4 m	*1.5 m
1	30 bar	25 mm	150	265	1.109	689
2	20 bar	25 mm	150	210	869	300
3	10 bar	25 mm	150	165	719	150
4	20 bar	25 mm	230	285	899	449
5	10 bar	25 mm	230	220	449	60
6	5 bar	45 mm	360	260	270	30

\* Distance from the facade of the nozzle operator.



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# Ensuring fire fighter safety in emergency responder scenarios

Fire and rescue personnel can face serious danger in a variety of situations but particularly when they find themselves separated from their colleagues due to circumstances beyond their control, or when they are off duty and respond in a personal capacity to an incident or are caught up in an incident.



**Colin Dale**

Colin Dale is Business Development Director for Vismo Global Tracking Solutions. For the past 30 years he has worked with mobile and satellite operators including T-Mobile in the International Roaming field. He has a degree in telecommunications from Liverpool University and is currently studying international terrorism at St Andrews University.

**S**uch situations can be found in fire and explosions in an industrial complex, a building or facility collapse when a demolition goes wrong, terrorist incidents, floods, war zones, aircraft crashes, multiple vehicle accidents, bush, forest and moorland fires, domestic and commercial property fires, and incidents at sea. They can also happen where emergency services vehicles – fire, police, ambulance, helicopter etc – are broken down or damaged.

Lone workers of emergency services are especially vulnerable because of the nature of their work and their precise whereabouts being unknown or unsure of by their colleagues or other service.

▼ **Optimising the chances of survival for the lone fire fighter could be critically important in some situations.**

## Duty of care

Employees of businesses benefit from duty of care legislation, where those businesses come under the jurisdiction of countries with such legislation or understanding and take action to protect their staff in potentially dangerous situations. Increasingly, that action includes equipping staff with people tracking apps that can provide true global coverage if required. Satellite trackers are used for areas where mobile phones signals are weak or non-existent.

Many Fortune 500 and FTSE 100 companies are equipping staff involved in commercial travelling with a people tracking app from Vismo, and providing the same for staff who work in potentially hazardous work environments and terrorism and kidnap hotspots. A number of UN agencies deploy the app in war zones and areas adjacent to them.



Image courtesy of Vismo Global Tracking Solutions

## ▲ People tracking can be useful in the unlikelyst of places.

Individuals, acting on their own initiative, also purchase the app and download it to their phone of choice. The principal users are employees of larger companies, however.

Where fire and rescue personnel do not have a people tracking app, the organisation in charge of them, or which employ them, are advised to refer to duty of care legislation [or the spirit of it in countries where the legislation doesn't exist].

## Examples of use

Although industrial accidents and other non-terrorist incidents are ideal for the application of the app, terrorism has been the focus in the past 18 months or so. During the attacks on the Charlie Hebdo offices and a supermarket in Paris in January 2015, 90 people – some, buyers in retail on their way to China – in the French capital had the app on their phones and were given advice by text as to what was happening, the areas to avoid and what to do if they were close to, or caught up in, the incidents.

In the attacks on tourists at a holiday resort in Tunisia, also in 2015, when 30

British holidaymakers died from gunshot wounds, 27 people in the country had the app on their phones and were kept informed about what was going on and how to minimise risks to themselves.

At a multiple bomb blast and gunfire at an election rally in Baghdad in 2014, a team of journalists attending the event helped a colleague who had become separated from them and found where she was via the app. She was directed to safety via a crisis management centre that operates in association with employers, the app and Vismo. It's one of a number of crisis management centres around the world that provides high level support to app users and information to their employers.

The centres keep employer organisations informed at all times, during an incident, about the whereabouts of their staff, including volunteers who work for them, and what is known about their safety and what is being done to reach a successful outcome.

The app was also in use in Paris in the attacks later in the year, including inside the Bataclan Theatre, where 89 people died and rescue services had a difficult time in their rescue bid due to gunfire. It was also on phones in Belgium when suicide bombers struck at Brussels Airport and the metro in the city in March 2016.

## How it works

The app is downloaded and installed on BlackBerry, iPhone, Android and Windows devices and, for those areas where there is no 3G or 4G mobile phone coverage, on satellite devices.

If users want to let their whereabouts – and what their circumstances are – be known, they activate a panic button on their phone. Immediately, a covert recording is made via the inbuilt microphone in their phone and transmitted in real time to a crisis management centre, where it's analysed along with any email, text and or voice message sent by the users.

In return, the users quickly receive advice and other information by text. The clearer the situation becomes to the crisis management centre, the more precise is the advice and information provided. In cases where a centre is aware of an incident before any individuals affected, it sends them an alert with information and the steps to take to minimise risk to themselves.

Each centre liaises closely not only with emergency services to share information, but with Vismo, whose servers integrate information received – after the panic button has been pressed – with the precise location [or locations if more than one individual is involved]. Each location is put





Image courtesy of Vismo Global Tracking Solutions

into a mapping solution commonly used by emergency services, and the information received is shared among those services.

Search and rescue swing into action – or are able to become better focused if already underway – with two-way voice and/or text communication used wherever possible to keep the at-risk workers informed, and reassured that help is on the way as quickly as possible. In some situations an emergency evacuation of a building or area will be made or attempted, with at risk personnel being given precise information about what is happening including how the evacuation will be carried out and what they should do or shouldn't do to facilitate it.

#### Features and capabilities of the app at a glance

- GPS Tracking, giving regular GPS fixes of events and allowing a user organisation's crisis management team to view current locations, historical trails, battery life and signal strength.
- Incident Response, showing the most current position of employees in the vicinity of any incident and sends advice, by text, on what action they should take.

- Geo-Fencing, enabling user organisations to set up "geo-fences" and receive text messages and email alerts when an employee moves into a high risk area or leaves a safe one.
- Online control, enabling user organisations to manage the risk and safety of all affected emergency workers from one secure, central, online location.
- Check-in/check-out, allowing personnel to register their arrival and departure to/from a location, via the app.

#### Optimised location accuracy while stretching battery life

Vismo was awarded a patent earlier this year for its technology for GPS tracking on mobile devices. The company previously had a patent pending and has now secured a full patent for its unique operation. The awarded patent, GB2470376, specifically covers the design behind the algorithms and innovative operations of the app to optimise location accuracy with minimal battery drain.

The algorithms use a combination of metrics from the phone, including speed of travel, GPS, network information and phone tower locations to determine optimal accuracy for locations without incurring the large battery drain usually typical of GPS tracking applications.

▲ Even a benign scene will pose dangers if transformed the next moment by a major accident or terrorist attack.

Critical to the approach is how Vismo utilises the functionality of mobile devices. The company minimises the use of navigational sensors by placing them into hibernation between pre-determined intervals and uses environmental information to quickly locate a device without lengthy GPS warm-up periods. Ultimately, this produces a chronological "trail" following a user's location point-by-point on a map.

#### To conclude

Lone workers and personnel in emergency responder situations anywhere in the world can be helped – and reassured – through the use of a people tracking app. Using the latest technology to pinpoint the exact location of the user and extend battery life, the app as developed by Vismo could be viewed as a natural extension of the technologies already employed by fire and other emergency services to help the safety of their personnel.

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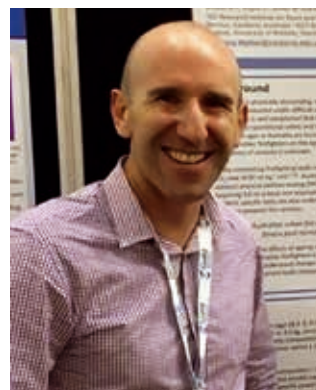
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# Monitoring practices of firefighter safety when working in the heat

Firefighters work hard, in environments characterised by high levels of ambient and radiant heat. To further add to their thermal strain, urban firefighters wear heavy, impermeable protective clothing in a range of operating conditions.



**Dr Anthony Walker**

Dr Anthony Walker has worked as a firefighter with ACT Fire & Rescue for the past 10 years. After experiencing, and witnessing a number of heat related events at work, he chose to pursue a research program into thermal stress experienced by operational firefighters with the aim to make firefighters safer. This program culminated in him completing a PhD through the University of Canberra, awarded his doctorate in 2015. Anthony has published extensively in the field of thermal physiology and regularly presents at both local and international conferences on firefighter safety at work and bringing research from the athletic field into the work environment.

**D**espite structural firefighting PPC being designed for internal fire attack, it is not uncommon to see firefighters wearing this clothing to a range of events, including motor vehicle accidents, where the risk of heat illness by and large outweighs the risk of thermal injury resulting from a fire. The human body aims to dissipate body heat, mainly through a process of evaporation of sweat from the skin surface. However, modern PPC is designed specifically with the purpose of reducing chemical and steam ingress from the environment.

Unfortunately, this comes with a trade-off, in that evaporation cannot occur, with sweat creating a humid micro-environment within the PPC, leading to increased body temperatures, dehydration and thermal strain for operators.

The internal heat load sustained by firefighters comes from the environment, through radiation, convection and conduction during firefighting operations.

▼ Firefighters entering the heat chamber to begin a search task.



▲ Ready for a break. Firefighters exiting the heat chamber at the end of the first work cycle (20 minutes).

This heat is then augmented by the metabolic heat produced as a by-product of working (exercising). Naturally, each individual may be working at different rates, based on their fitness, their technical ability and their motivation to perform. This will then result in differing thermal loads leading to a range of body temperatures during work programs, making work/rest times problematic as a definitive tool to manage heat stress of firefighters on the fireground. To compound this problem, individuals have varying tolerances for body temperatures, making a “one size-fits all” model difficult. Guidelines for workers have been developed for working in the heat in other jurisdictions, however approaches to managing firefighters at fire scenes are not universal among different fire services in Australia.

Both the International Organisation for Standardisation (ISO) and the National Fire Protection Association (NFPA) recommend that body temperatures for workers are limited to less than 38.5 °C during work tasks. Furthermore, allowing individuals to work at those temperatures require that they are “medically screened, heat acclimated and medically monitored (ISO 9886).” It is currently unclear whether this practice is actually followed in

Australian fire services, raising questions regarding the ongoing safety of an ageing workforce delivering emergency response capabilities in the heat. Anecdotal, as a general rule, reentry is guided by the question “are you right to go mate” rather than actual physiological data. Thus, the focus of this article, will therefore be on whether, in the absence of formal monitoring, current practices for redeployment of firefighters during long-duration events can give a reasonable estimate of their safety.

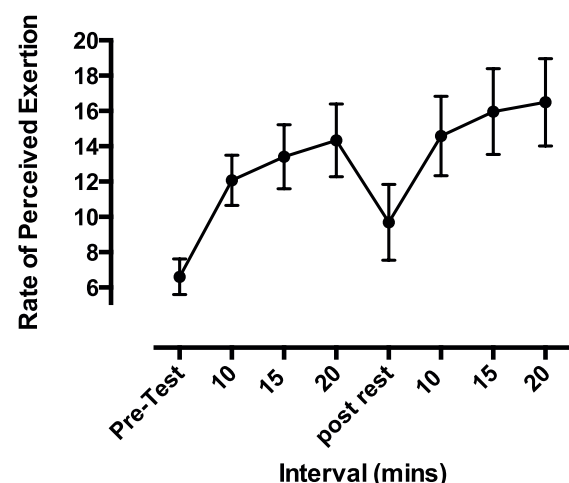
In order to understand the extent of thermal strain on firefighters, ACT Fire & Rescue, led by Dr Walker, undertook a number of research projects, based out of a purpose built heat chamber operated at their training centre in Canberra.

Temperatures were set at approximately 100 °C, with 145 volunteers from that service completing two 20-minute search and rescue tasks in smoke and darkness, separated by a 10-minute passive recovery where they removed their jackets and drank cool water. This protocol closely replicates those conditions likely to be encountered by urban firefighters during an emergency firefighting response. Firefighters were monitored for core temperatures using ingestible thermometers, heart rates and skin temperatures. These measurement tools were then compared with perceptual responses (How hard are you working – Rate of perceived exertion? How hot are you- thermal sensation?) given at 5-minute intervals during work and rest.

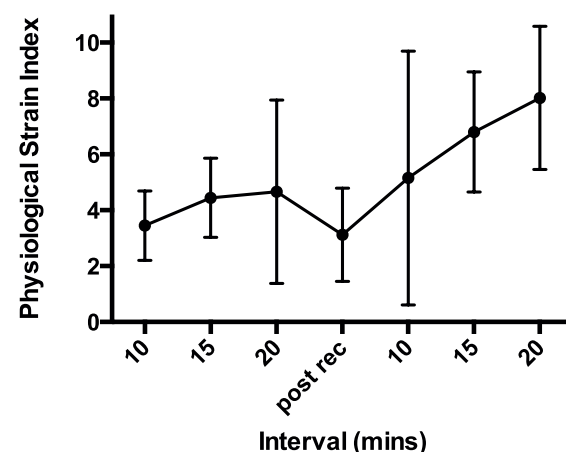




▼ Figure 1: Mean (SD) Perceived exertion of firefighters during two simulated work tasks in the heat.



▼ Figure 2: Mean (SD) Thermal strain of firefighters during two simulated work tasks in the heat.



### Some results to consider

- Core temperatures (Figure 3)
  - reached an average of 38.9 °C at the conclusion of the second work task. This is well in excess of safe working limits. Furthermore, 3 participants recorded temperatures in excess of 40 °C.
  - Continued to rise during the rest period, in spite of removing PPC
- Skin temperatures were elevated during work tasks and dropped significantly during rest. (Figure 3) This is due to removing PPC and evaporation of sweat beginning
- Heart rates of participants reached approximately 90 % of their maximum (established during lab testing, not by estimation). The work tasks were standardized, meaning that increasing heart rates were due to elevated core temperatures

- Both perceived exertion and physiological strain (Figure 1 and 2) increased during the work tasks and dropped during the rest period. This is in spite of core temperatures continuing to rise and is therefore linked with skin temperatures

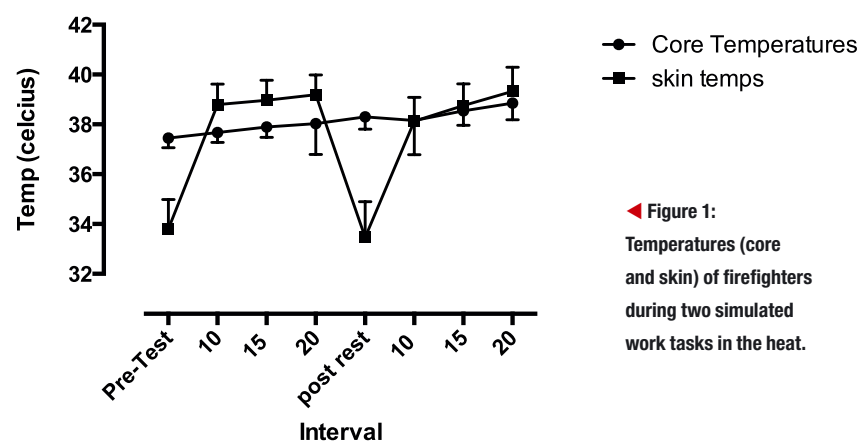
When incident controllers make assessments of firefighter wellbeing based on their perception of wellness, this research indicates that this is likely an unsafe practice. Firefighter's perceptions of their wellness are linked with their skin temperatures, which in turn are affected by exposure to hot environments, wearing PPC. It is therefore intuitive to expect that, when they remove their jackets and sit in the shade they will believe that they are recovering, however this research indicates that this is not the case. In lieu of providing physiological monitoring on the fireground,

which at this point in time can be expensive and impractical, a strategy could be to enforce work/rest cycles in line with NFPA 1584. This document states that firefighters should enter rehab sectors following a second work cylinder in the heat. Based on the results of this study, this seems entirely practical and appropriate for Australian firefighters working in the heat.

### Overall recommendations

- Firefighters must be properly conditioned to work in the heat with high heart rates expected to occur. They must therefore be medically screened as those with existing cardiac risk factors are likely to experience elevated risk
- Fire services and incident controllers must plan for adequate resourcing to ensure that firefighters can maintain safe work/rest cycles during emergency responses.
- In line with NFPA 1584, fire services must provide evidence-based effective post-incident cooling practices. As evidenced by this research, the current practice of removing PPC and providing only water is both ineffective and unsafe. Practical solutions include iced slush drinks and cold-water immersion (multiple body segments – ie lower body at a minimum)
- Research activity in the future should focus on the development of a practical, cost effective tool for measuring core temperatures in the field. Relying on perceptions of wellbeing as a sole measure may be unsafe

◀ Figure 1: Temperatures (core and skin) of firefighters during two simulated work tasks in the heat.



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# No smoke without fire water: it's time to close in on pollution containment

It's a surprising fact that the most likely environmental damage caused by fire at an industrial site is not actually a result of the fire itself, but the water that is used to fight it. It's not air pollution or even the combusting materials themselves that most often cause serious environmental harm in major industrial fires, but the huge quantities of fire water discharged in a very short time to get the fire under control.



**Phil Collins**

Phil Collins is National Water Pollution Manager for Hydro International's Stormwater Division for UK and Ireland, headquartered in Clevedon, Somerset. With over 15 years' experience in the control and treatment of stormwater and wastewater, Phil leads Hydro's expert Water Pollution Management team which has considerable experience and expertise in the assessment and design of spill containment systems. In particular, Phil is keen to raise awareness of water pollution containment issues for industrial, commercial and warehousing sites and raise awareness of the importance of installing the correct pollution containment valves on site to avoid unforeseen incidents.

**I**n the early stages of a major industrial fire, thousands of litres of water are discharged into the environment every minute. The surface water runoff created will pick up the pollutants and contaminants of whatever burning or hazardous substances are present, and if a site is not fully contained, they will escape into the local environment. There is even the potential 'worst case' scenario of fire water and heavy rainfall combining to overwhelm a containment area.

When such events occur, the water can find routes to flow across a site in directions no-one had ever expected,

▼ Fire fighters pictured during the incident at Buncefield.



let alone mapped, before ending up in a river or sewer. Such a pollution incident can lead to crippling costs to pay for the cleanup and to put right the environmental damage. Most companies believe that they are fully insured under their standard material damage liability policy, but could find they their insurance does not fully cover them for remediation costs required by the regulator.

## Fire Water Runoff

The fire at the Jayplas plastics and paper recycling plant in Smethwick in June 2013 is memorable for having been started by a Chinese lantern. The fire was the largest ever dealt with by the West Midlands Fire Service which deployed over 200 firefighters and

nearly 40 appliances to deal with the fire involving 100,000 tonnes of plastic recycling material. The incident serves as an example of the amount of water that can be used in a fire incident: in the first 12 hours of operations, 14 million litres of fire water were needed and water was pumped from the nearby Birmingham Canal.

Following a fire at another recycling plant in Kidderminster at around the same time, the Environment Agency was reported to be engaged in a clean-up operation to raise oxygen levels in the Staffordshire and Worcestershire canal. According to reports, the oxygen levels dropped as low as 1% and 200 fish died. Following a warehouse fire at Bilston in Derbyshire in 2011 the Canal and River Trust was involved in rescuing fish at a cost of £1,000 a day, although 100,000 fish died, according to the media reports.

## Regulations and Guidance

Industrial, commercial or warehousing facilities that use or store hazardous or polluting substances need to take steps to ensure they do not escape into the environment. Pollution containment is critical for sites operating under the Control of Major Accidents and Hazards (COMAH) 2015 or Environmental Permitting (England and Wales) Regulations (EPR) 2010. It should also be integral to any compliant Environmental Management System (EMS) – or for those companies working to ISO 14001.

Revised COMAH Regulations came into force in June 2015 giving all sites 12 months to review their compliance. Sites that are vulnerable to flooding or pollution spills are strongly advised to review both their on-site protection and the risk assessment evidence they need to support it.

Even for sites where the substances stored are not hazardous in themselves, fire fighting water can still be a concern. As the above examples demonstrate, fires at waste handling and recycling sites have been a particular focus for concern in recent years.

Following the high-profile fires at waste handling premises, the Environment Agency issued revised Technical Guidance for sites storing combustible waste in 2015, instructing them to review their fire accident planning with a 'must' action to meet the standards.

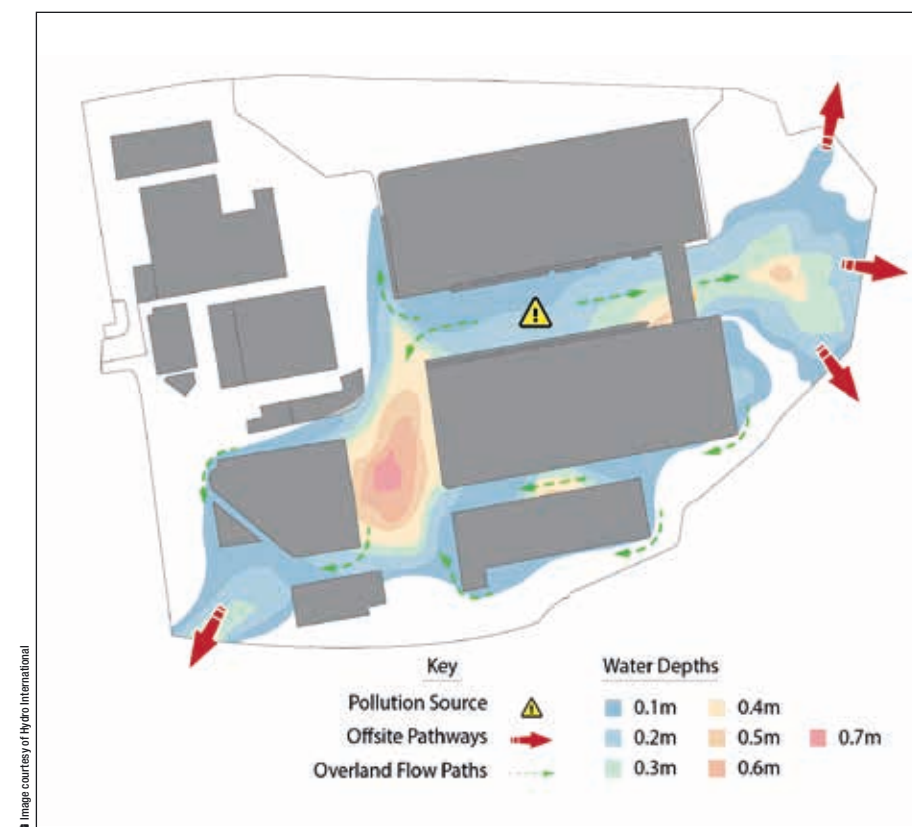


Image courtesy of Hydro International

WISH (The Waste Industry Safety and Health Forum) has also issued helpful industry guidance "Reducing Fire Risk and Waste Management Sites". During 2014 the Environment Agency reported 10 serious water pollution incidents involving waste management activities, five of which were caused by fires and three by containment and control failures.

## Buncefield

After the Buncefield disaster in 2005, the Health and Safety Executive found that protective bunding had many flaws that caused large volumes of fuel, foam and fire fighting water to leave the site.

The site's last line of water pollution defence – so-called tertiary containment – was practically non-existent, amounting only to the sites surface drainage systems which were not designed to cope with any large-scale releases. In July 2010 five companies were fined a total of £9.5 million for their part in the Buncefield disaster.

The UK's central industry guidance document CIRIA 736 Containment Systems for the Prevention of Pollution was significantly revised in 2014 in the light of lessons learned, particularly from the Buncefield disaster and sets out clear guidance on the steps to take for water pollution containment.

▲ 2D overland flow mapping of pollution and flooding.

## Sources and Pathways

Operators should have a thorough understanding of potential water pollution sources and pathways – especially where their site is located in a flood-prone area. Many firms are unknowingly risking water pollution incidents because they rely on inadequate containment systems, or because they do not know how flood water or surface water runoff will be directed on and off their site.

Providing evidence of how surface water is discharging to the environment should be on the agenda of any company that is keen to act sustainably. As well as being environmentally unacceptable, inadequate water pollution containment could be very costly.

As government funding is cut back, environmental authorities are increasingly being forced to relinquish their advisory role and are enforcing regulations through prosecution. Furthermore, regulatory authorities are now clamping down with big fines and stricter expectations on organisations to provide proof of the measures they have taken to protect themselves and the surrounding environment. If they cannot provide such





▲ The Hydro-Brake Isolator valve installed on site.

proof then they may be forced down the route of expensive remediation that might otherwise have been avoided.

The "Polluter Pays" principle allows for the recovery of costs needed to put the environment back to how it was before the incident. Incidents involving the regulator are unlikely to be fully covered under a company's standard material damage liability policy.

Following a prosecution for a water pollution incident, fines can be significant. In the worst cases, a pollution conviction can even include the option of custodial sentences for company directors. Given the financial costs and the potential loss of reputation for any company, it's clear that taking steps to avoid such a scenario is highly commercially advisable.

In another reference, CIRIA C736 gives details of a Huddersfield manufacturer and repackager of chemicals such as fungicides, insecticides and pharmaceutical products which suffered a fire in May 2010. According to the case study, approximately 5000 m<sup>2</sup> of fire fighting water and 20 m<sup>2</sup> of foam were applied to the site in the first five hours of the fighting the fire. The site's tertiary containment system was not able to cope with the quantities of fire fighting water runoff and foam generated and consequently significant quantities escaped the site boundary into the River Colne.

The case study details how the company embarked on a number of improvements following the fire starting with surveying and tracing all site drainage to understand how fire fighting water is transported around the site during the incident and developed a plan for managing fire fighting water runoff from future incidents.

### Pollution Containment

To provide water pollution containment, most companies begin by installing isolation valves in the outlets to surface water drainage to prevent flood or fire water escaping from the site and contain it until it can be safely removed and tankered away. In addition, bunds or physical barriers can be constructed, especially around hazardous areas, such as oil or chemical tanks to contain spills.

It's important that valves are of the correct design. Often companies install a penstock, but the word 'penstock' represents many types of valves that do not all have the ability to drop seal low pressure flows fully; if a site is looking to contain pollution then the valve must contain the entire flow. Penstocks are closed by the force of the 'head' of water rising in the drain.

We recommend using drop seal valve technology which is the latest technological development and provides a watertight, failsafe solution that is already installed at more than 150 sites across the UK. The latest version is called the Hydro-Brake® Isolator pollution containment valve.

On more complex sites, operators will also still need to be sure that, even with valves installed, in the case of a fire incident, the surface water drainage won't back up, overtop bunds and storage measures and flow out of the site into the surrounding environment.

CIRIA C736 recommends a full risk assessment based on the source-pathway-receptor model to aid in a holistic containment strategy based on the hazards of the site. Hydraulic modelling techniques are a valuable way of mapping the surface water pathways on and off a site, then test out and prove any valves, bunds or temporary storage measures that are then proposed. A solution can be designed and constructed in the safe knowledge that any potential incident will be fully-contained.

Waste and recycling operators interested in the Hydro-Brake® Isolator pollution containment valve or Water Pollution Management hydraulic modelling can book a free initial on-site assessment.

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## Planning for catastrophic disasters

The hallmarks of catastrophic disasters are death and destruction, large scale disruption of communities and businesses, the displacement of populations and public anxiety. Often they occur with little to no warning, overwhelming the capacity of institutions and the community to cope. Emergency leaders are posed with overwhelming issues, with complexity and uncertainty on a scale they likely have never experienced nor imagined. The event becomes subject to significant national and international media scrutiny, and inevitably, political involvement.



**Andrew Gissing**



**Professor John McAneney**

Andrew is the Director Government Business and Enterprise Risk Management at Risk Frontiers, an independent Research Centre set up as a R&D company at Macquarie University in Sydney, Australia. He works with Risk Frontiers clients to deliver pragmatic solutions to enhance disaster resilience.

John is the Managing Director of Risk Frontiers. John leads the Risk Frontiers team in their mission to assist clients to better understand and manage risks.

**C**atastrophic events are cascading in nature, escalating in their impacts as interconnected essential services fail yielding yet further impacts and making the recovery more complex and prolonged. Events may not respect borders or boundaries resulting in unclear accountabilities amongst responding agencies, and conflicting strategies and public messaging as different jurisdictions respond.

The recovery of communities may take many years, with many of the impacted population choosing to re-locate to other areas permanently. Economic losses can be severe as industry is disrupted, businesses close down and yet further demands for capital injections from Government to support recovery costs.

When managed poorly, a loss of public trust in officials may emerge with resulting political challenges. Official commissions of enquiry are held, which provide opportunities for improving systems, reducing risks and enhancing plans to better manage future events. Often, however, such learnings are forgotten as memory of the disaster fades only for many of the same issues to emerge as problems in the next event. The performance of leaders will be judged through the expectations of others with the obvious advantage of hindsight.

### Australian catastrophic disaster risk

Luckily Australia has not historically suffered from large catastrophic events as experienced overseas such as the European 2003 Heatwave, the Asian 2004 Tsunami, the Christchurch 2010-2011 earthquake sequence and the

Nepalese 2015 Earthquake. This luck may reflect a lower frequency of large earthquakes and low population densities, coupled with investments in disaster mitigation and warning systems. Australia has, however, experienced disasters that have clearly overwhelmed the ability of institutions to effectively respond: the Victorian Black Saturday Bushfires (2009) and the Queensland and Victorian floods (2011) offer recent examples. The 1974 destruction of Darwin by Cyclone Tracy was also a defining moment in Australia's emergency management history.

It is inevitable that more catastrophic disasters will occur. Significant grey risks are being created by increased urban development in at-risk areas. Our understanding of disaster risks tells us that events greater than those previously recorded are possible. This knowledge may be flawed or our imaginations may fail us: how many, for example, predicted the events of September 11 or how the Tōhoku earthquake and tsunami would unfold?

In the remainder of this article we consider some key aspects of planning for catastrophic disasters in the context of Australia.

### Planning for catastrophe

Catastrophic disasters are different from every day disasters. Response strategies that routinely work in smaller events will be quickly overwhelmed and ineffective. The role of emergency management agencies becomes focused on providing leadership, facilitation, subject matter expertise, public information and warnings, and specialist resources. In the United States a government-centric approach has been recognised as being



insufficient to meet the challenges posed by large disasters. Government is only one part of the overall team; and that arrangements must leverage all of the resources available. Responsibilities for community safety must be shared.

While emergency planning in Australian has traditionally been inwardly focused on the roles, responsibilities and strategies of emergency services and Government Departments, here too there is an emerging theme of community-based planning that aims to link locally-based response initiatives with wider Government-led emergency plans. No single agency is capable of responding to such high impact events alone and a whole-of-Government response in partnership with the community will be the only answer.

Ultimately, the ability to withstand and recover quickly from a catastrophic disaster comes back to the resilience of the impacted community and it is important that emergency management leaders tap into and exploit capability within the community, including local knowledge. These capabilities may not, however, be well-organised prior to the event occurring and this makes it difficult for emergent

groups to be recognised in advance within disaster plans. Emergency management agencies should, however, proactively support the emergence of such groups, and have arrangements in place to work with them.

Catastrophic disaster risk assessments need to be based upon realistic assumptions; for example how long will the community be isolated? What is the expected number of casualties and damaged buildings? What might be the extent of infrastructure disruption and how long will it be down?

Scenario modelling approaches should be utilised: scenario planning combines sophisticated modelling techniques together with imagination and experience drawn from other large events both here and overseas. Risk Frontiers, with funding from the Australian Bushfire and Natural Hazards Cooperative Research Centre, is currently completing a series of disaster scenarios of national significance in Australia to assist emergency managers conceptualise and imagine catastrophic disaster risks. Some of these scenarios were published in the January edition of the Asia Pacific Fire Magazine.

Plans must be based upon an understanding about how a disaster event may unfold, in other words a dynamic view of the event is needed rather than just a static snapshot of the maximum consequences that may occur. For example, a catastrophic flood in Sydney may begin with a series of smaller flood and storm events that saturate catchments, fill water storages and steadily fatigue emergency resources, before the truly large flood occurs.

Plans must also be dynamic and able to adapt to unforeseen circumstances, complex variability and uncertainty. They also need to define the accountabilities of stakeholders.

A small number of specific disaster plans already exist for catastrophic scenarios such as for severe flooding in Hawkesbury Nepean Valley in Western Sydney. These plans consider consequences across wider regional areas spanning multiple Local Government Areas and assist to place the overall risks in sharper focus.

▼ **Damage from Asian Tsunami 2004.**



Image courtesy of Andrew Gilding and Professor John McAneney



Image courtesy of Andrew Gilding and Professor John McAneney

Testing of capabilities utilising realistic disaster scenarios will help identify gaps and improve the knowledge of institutions as to the limitations of their capabilities. Planners must consider wider jurisdictional and national capabilities. In some instances public-private partnership arrangements may supplement capabilities. Corporations through their corporate social responsibility programs can enhance community resilience and responses to disasters, such as the efforts of Wal-Mart after the impact of Hurricane Katrina in the United States. Other examples include Facebook establishing a safety check application for people to report that they are safe following a disaster, and Airbnb launching an initiative to coordinate emergency accommodation and relief in disaster affected areas.

International support arrangements have not been well recognised within jurisdictional planning for emergencies in Australia but may be essential after catastrophic events. How such resources link in with overall jurisdictional based arrangements requires better definition.

Building an effective surge capacity also requires a national focus on interoperability. Although progress has been made in this area, these efforts need to extend nationally to ensure seamless operations, and effective inter-jurisdictional deployments by utilising common systems, intelligence, equipment, processes and management structures.

Measures should be considered to regularly evaluate, measure and publicly report on disaster preparedness and capability to provide transparency of the readiness of public institutions to respond to catastrophic disasters. Such reporting is now common in the United States but Western Australia is the only State in Australia to do this.

### Conclusion

A catastrophic disaster in Australia is inevitable at some point. This might comprise a significant earthquake in a major metropolitan area, contemporaneous flooding across multiple catchments, a season of especially large bushfires across many states that exhaust the capacity of

▲ **Damage from Christchurch Earthquake 2011.**

emergency services, or a tropical cyclone with wind speeds well in excess of the construction design standards. It must be accepted that in such an event emergency management agencies will be overwhelmed and no single agency alone will be able to cope with the demands expected of it. That being the case emergency management agencies will need to recognise their limitations and perform collectively in concert with the community. Emergency managers need to build strong bonds and trust with the community and private organisations, so that a whole-of-community approach can be employed. Importantly such response efforts should be accompanied by more investment in disaster mitigation including risk-informed land use planning to prevent amplifying existing catastrophic disaster risks.

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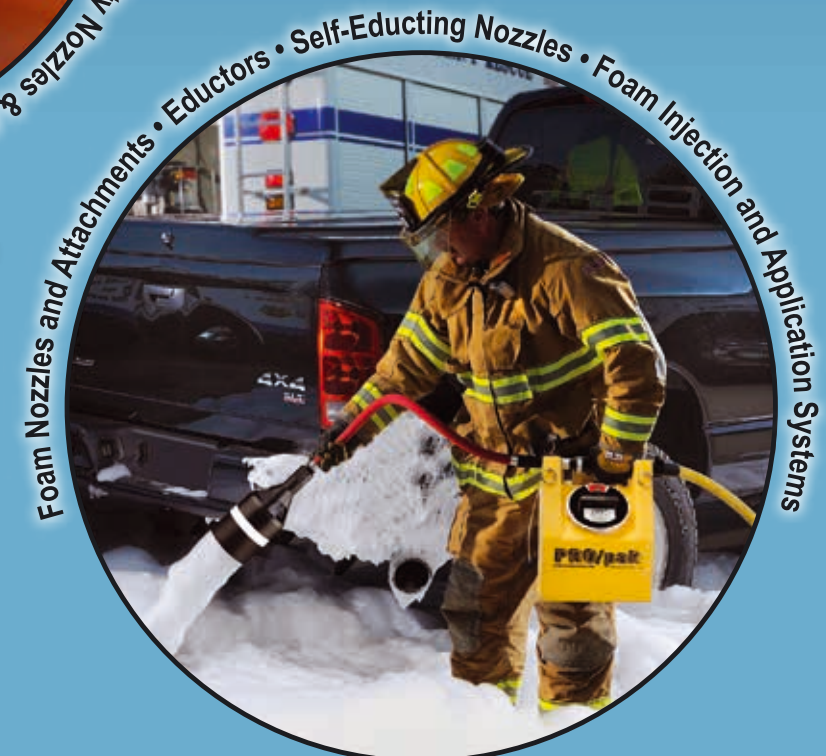
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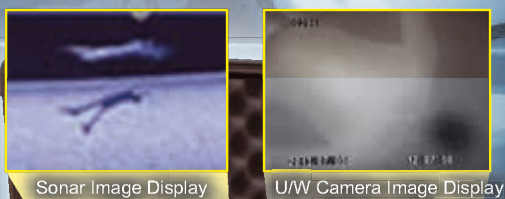
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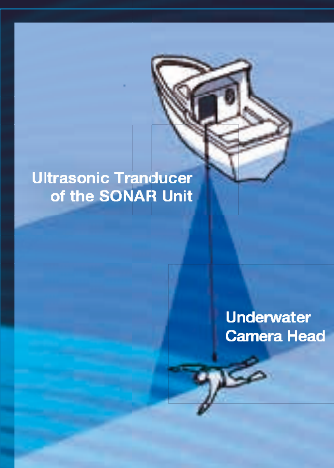
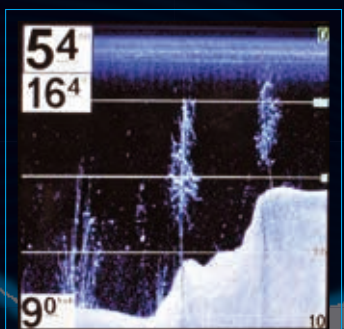
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Cover image: Providing maximum fire suppression performance, automatic nozzles offer wide ranging flexibility in challenging firefighting conditions. Maintaining a constant nozzle pressure throughout a wide range of operational flows ensures a hard hitting straight stream and wide protective fog pattern. Image courtesy of Task Force Tips.

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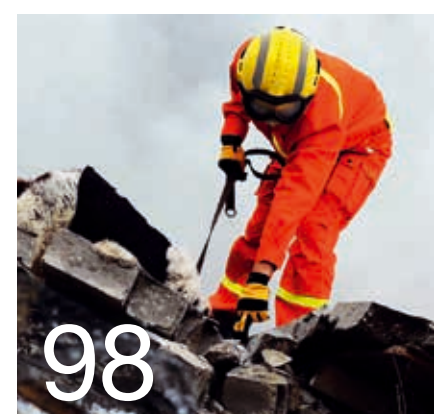
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# Why do people find diversity so difficult?



## Becci Bryant

Chief Fire Officer/Chief Executive with Staffordshire Fire and Rescue Service



**W**hen I joined the Fire and Rescue Service as a firefighter in 1992 – 10 years after women started to do so – I was one of three women that had successfully completed the recruits' course in Bedfordshire and Luton Fire and Rescue Service that year.

In 1999 Her Majesty's Fire Service Inspectorate carried out a thematic review into 'Equality and Fairness in The Fire Service'. They concluded that, despite the efforts of many in the service, as of March 31 1998 there were only 436 women employed within the wholetime uniformed (excluding fire control) strength of 33,597 and a retained service of 14,483. This was less than 1% of these sections of the workforce.

Following the findings of this review, Fire Service Circular 1/2000 set a recruitment target that from 1 April 2002, 4% of uniformed staff (excluding fire control) should be women, by 2004 this should be 9% and by 2009 this should be 15%.

Now fast forward to then Home Secretary Teresa May's first speech on fire service reform on 23 May 2016 in which she explained that the operational workforce is currently comprised of 96% white and 95% male members of staff.

The latest data from the NJC Inclusive Fire Service Group shows, that of the 31,965 personnel operating in Firefighter to Area Manager roles, 1541 are women (4.8%) and of the 15,546 retained personnel, 559 are women (4%).

Despite the considerable efforts of committed and dedicated individuals, the operational workforce within Fire and Rescue Services is still not representative of our communities. The details of this reform speech have made it very clear that this is a position that needs to be improved significantly over the coming months and years.

The question we are faced with is this: how do we achieve these improvements at a time when recruitment to whole-time firefighter positions is limited, restricted or frozen in some cases, and recruitment to retained positions continues to be a challenge for many Services around the country?

Given the fact that women have served in the Fire Service since 1982, we have to ask ourselves if it is acceptable that it has taken so long for a woman who joined as a firefighter to become a Chief Fire Officer. I personally don't think it is and despite the challenges we face in ensuring our workforce is diverse, I do not believe it is acceptable that so few women occupy senior positions within Fire and Rescue Services.

Some will call for the reintroduction of targets and others for quotas, both of which have advantages and disadvantages. Numerous techniques are used by Services to attract women into the role of firefighter, all linked to positive action.

I have had numerous conversations up and down the country with a variety of people who seem to use the

same language they would use when determining a business case for an item of equipment. Why are we using the same language in a conversation about people who we would like to join our organisations? For me there is no business case separate from our business. It is either the way we run our organisations, or it is not. We either value difference and develop our teams to the full or we don't.

It makes complete sense for our workforce to be as diverse as our communities.

Britain today is not only more diverse than ever but the diversity itself is growing even more diverse. Individual identities are more complex and fluid than ever before and as such, organisationally, we need to reflect that complexity to really connect with our communities and partners.

Diversity is not enough, however, without leaders creating a culture that embodies inclusion as a fundamental building block. Without this, the voices of our diverse workforce will not be heard and their contributions will not be as significant as they could be.

When we ask ourselves the difficult question – why have we not been successful at increasing the recruitment of women – is it because our cultures are not very accepting of difference?

It is a key responsibility of leaders in the Fire Service today to create an environment and a culture that encourages, embraces and is inclusive of diversity. This, in my opinion, is one of the most significant challenges facing Fire and Rescue Services today.

There is fantastic work going on around the UK and further afield and now is the time to harness the best practice and support each other in the challenge ahead. The Inclusive Fire Service workstream operating under the NJC has a real opportunity to support this area of fire reform and I look forward to seeing the outcomes of this work over the next few months.



## New Mi TIC E+ entry level camera from argus

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ensure that even in the most extreme of temperatures, the firefighter is able to see and react to trip hazards, entry/exit points and casualties from the clutter of fire, smoke and building damage.

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## Magirus equips Hungary's fire departments with 15 turntable ladders



Image courtesy of Magirus

In 2014, Magirus delivered five M42L turntable ladders to Hungarian fire departments. The high level of satisfaction with these turntable ladders led to a follow-up order for 15 single-extension units.

The first five turntable ladders of the complete order – which consists of twelve M32L-AS Magirus turntable ladders and three M42L-AS – were officially presented to the National Directorate General for Disaster Management (NDGDM) in Budapest. Károly Konrád, representative of the Ministry of the Interior, and Tibor Tollár, NDGDM General Major, officially accepted the four M32L-AS turntable ladders built on Iveco EuroCargo chassis as well as one Magirus M42L-AS turntable ladder.

In the future, the turntable ladders with

a working height of 32 metres will support fire departments in the Hungarian cities of Kiskőrös, Dombóvár, Pétfürdő and Győr during fire-fighting operations. The Magirus M42L-AS will be stationed in the city of Nyíregyháza, a town with 120,000 residents.

With this follow-up order, which will be complete in 2019, Magirus highlights its turntable ladder competence and position as the market leader in Hungary as well as northern and eastern Europe in general.

With this order, Magirus highlights its turntable ladder competence and position as the market leader in Hungary as well as northern and eastern Europe at large.

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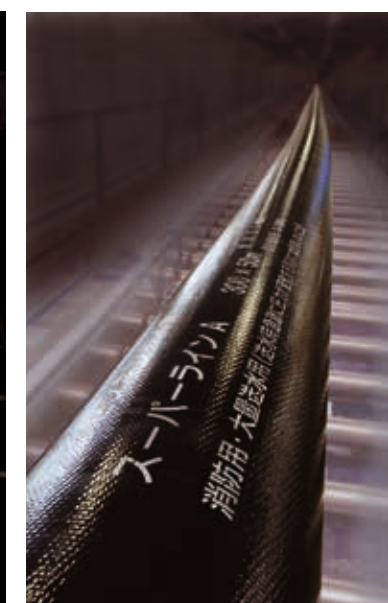
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Color		orange	orange	orange	black	black
Wall thickness	mm	3.5	3.5	4.0	4.6	5.0
Weight	kg/m	1.1	1.6	2.8	4.0	4.8
Burst pressure	MPa	4.2	4.4	3.6	3.0	2.8
Maximum working pressure	MPa	1.6	1.6	1.4	1.4	1.4
Temperature range	°C	-20°C ~ 50°C				



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## Hampshire firefighter Nikki Bridges helps African school children

Nikki Bridges, a firefighter from Lyndhurst Fire Station in Hampshire, UK has worked as a volunteer for The African Adventure Foundation along with five other climbers, helped to raise £8,600.

Firefighter Bridges, who is 32, was in Kenya for 16 days and spent time at The Jubilee Academy School helping with renovation and improvement work. She was able to use her rope skills and fitness to improve the lives of school children in Kenya.

Nikki said: "The children loved hearing her stories about the fire service and seeing photographs of the engines.

"It was an emotional rollercoaster, it's overwhelming to see how happy the children are to have you there, but heartbreaking to see how little they have. I won't forget Donation Day when we gave the children clothes, books and skipping ropes amongst

other things – a simple thing like a pencil each brought so many big smiles.

"I thought going to Africa was a once in a lifetime opportunity, but now I am feeling drawn to go back. "Maybe it's the bond I made with the children or the uplifting achievement of knowing that I've helped just a little to make a few lives better.

"I think that being a firefighter helped as you are used to dealing with challenging situations and I used rope skills to help make swings. The mountain climb was hard going and a little bit hazardous but again I think the job and experience in dealing with risk was of benefit."

Whilst in Kenya she also spent five days battling bad weather to reach the summit of Point Lenana, Mount Kenya - where she met the Saracens Rugby Team carrying their European Cup.



Image courtesy of www.hantsfire.gov.uk

Nikki is now hoping to get a team of 20 personnel from Hampshire Fire and Rescue Service to take on the 2017 Mount Kenya Challenge to raise money for The Firefighters Charity and The African Adventure Foundation.

For more information, go to [www.hantsfire.gov.uk](http://www.hantsfire.gov.uk)

## Expansion to 9/11 Memorial Stair Climb

Pierce Manufacturing Inc., an Oshkosh Corporation company, hosts the fourth annual 9/11 Memorial Stair Climb at historic Lambeau Field, Green Bay, Wisconsin on Saturday on September 10th 2016. All funds raised will benefit the National Fallen Firefighters Foundation (NFFF) to assist the families of fallen firefighters. The 2016 Memorial Stair Climb is co-sponsored by the Green Bay Metro Fire Department. Organizers are hoping that 1,000 participants will come together this year to honor the firefighters who perished in the World Trade Center attacks fifteen years ago. Since forming a partnership with the NFFF, Pierce has raised more than \$325,000 to assist the NFFF's mission to help the families of fallen firefighters rebuild their lives through support networks, conferences, workshops and scholarships.



Image courtesy of Pierce Manufacturing

For more information, go to [www.piercemfg.com/climb](http://www.piercemfg.com/climb)

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## Student receives \$1000 scholarship

Storey County Professional Fire Fighters have announced the recipient of their "2016 Scholarship Award." This education-based donation is part of an annual effort for the firefighters to further education in their community. Jordyn Ballard of Virginia City High School was presented with a \$1,000 scholarship, which will help with her tuition this year. Jordyn plans to attend the University of Nevada, Reno to study education.

Auggie Arroyo of the Storey County Professional Fire Fighters, said, "It's important to continue to recognize and support the hard work of young adults in our community. We are proud of Jordyn and her dedication to higher education. We look forward to watching her success grow at the University of Nevada and into her career where she'll have a hand in educating future generations."



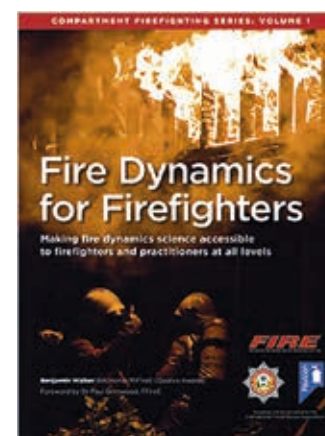
Image courtesy of Storey County Professional Fire Fighters

## Award winning authors new book

Author Benjamin Walker BA(Hons), MIFireE is a globally acclaimed presenter and international compartment firefighting instructor. He has worked in both the UK and USA, and was recognised by the Institution of Fire Engineers in 2014 when he was the recipient of the Godiva Award.

His latest book, *Compartment Firefighting Series: Volume One* simplifies the science of fire dynamics for all frontline and trainee firefighters. Firefighter safety is an inherent part of the job and modern firefighters are accountable for keeping up with professional development and training through self-study. The book will help you;

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## Hainsworth Technology products selected for CPCC

Hainsworth Technology fabrics have been chosen to be part of the prestigious Central PPE and Clothing Contract (CPCC). The company's TITAN 1260 and ECO-DRY Active are the selected combination for structural garments, while its ECO-DRY Shield has been chosen for wildland garments.

The decision to include the fabrics as part of the CPCC follows the Technology Refresh programme, the most extensive independent PPE reassessment ever undertaken in the UK. The CPCC replaces the previous programme, Integrated Clothing Project (ICP), and is intended to take the procurement scheme well into the 2020s. The CPCC is available to any Fire and Rescue Service in England and Wales to join free-of-charge and

membership gives access to a full range of best-in-class products and services.

Tom Hainsworth, Managing Director of Hainsworth Technology, said: "We are delighted that TITAN 1260, ECO-DRY Active and ECO-DRY Shield have been selected within the CPCC. As a business, we are committed to listening to firefighters about their requirements on the frontline as well as working closely with our industry partners. We are also continually looking for ways in which we can innovate and develop our products to ensure they keep pace with the changing and often complex needs of today's fire and rescue services both within the UK and globally."

For more information, go to [www.protectsy.co.uk](http://www.protectsy.co.uk)



Image courtesy of Hainsworth Technology

## Fire officer rescues swimmers

A West Midlands fire officer from the West Midlands Fire Service, UK has braved the Mexican waves to rescue four swimmers while on holiday. Lee Baker, who is Station Commander for Bournbrook and Woodgate Valley community fire stations, swam into action during his holiday in Puerto Vallarta on Mexico's North Pacific coast. He'd been taking a mid-afternoon walk



Image courtesy of WMFS

along a beach with his wife when they were approached by a Mexican woman. She asked if Lee could swim because some of her family were in difficulties in the water.

Lee said: "My wife stayed with the woman while I went in and walked one lady out of the sea. She was struggling to stand because of the strong current. The waves were high and she said others were in trouble further out. I swam out and managed to grab a girl, aged around 17, who was struggling and screaming. I started to swim back, holding her, as I pushed a lad who looked a little younger in front of me.

"The boy seemed to be in a better state, so I focused on the girl. She went under a few times, then a man came out with a rescue float when I was close to the shore and the girl grabbed it. I then towed her in until others took her, then I went back to the boy and threw the float before pulling him in as well."

Two waiters who worked nearby came to help, as Lee put the girl in the recovery position and made sure she was comfortable. Lee, who also helped with the rescue of a fourth person, added: "The family were really thankful. I got hugs and handshakes, and I just said I hoped they would be OK and checked on the girl's condition before we headed off."

WMFRS Deputy Chief Fire Officer, Phil Hales, praised Lee's actions: "We're very proud of him for potentially saving the lives of these swimmers and preventing a tragedy. All of our firefighters and officers are highly trained to deal with emergency situations. Even when they're off duty, they're always ready to help the community."

Councillor John Edwards, Chair of West Midlands Fire and Rescue Authority, added: "We're all very proud of the life-saving action taken by Lee. He encapsulates everything that is great about the remarkable staff who work for West Midlands Fire Service."

For more information, go to [www.wmfs.net](http://www.wmfs.net)

## Firefighters back ABI sprinkler call

With just one month until the commemoration of the Great Fire of London, more than a dozen organisations have so far confirmed their support for proposals to ensure sprinklers are installed in more high-risk buildings, put forward by the Association of British Insurers (ABI).

Several major fire brigades as well as the Chief Fire Officers Association and a number of fire prevention bodies have all added their names to a call for action on sprinkler regulations to help prevent major and potentially deadly fires.

The ABI has issued the following call to Government:

"As the three hundred and fiftieth anniversary of the Great Fire of London approaches we urge the Government to modernise fire prevention rules by legislating for compulsory sprinklers in all new schools and care homes, and warehouses over 2,000m<sup>2</sup>. Fires put lives at risk, cause disruption to our cities and transport networks and hurt the economy; failing to install sprinklers in schools and care homes is putting at risk the lives of the most vulnerable in our society."



For more information, go to [www.abi.org.uk/News](http://www.abi.org.uk/News)

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## London Fire Brigade looks beyond the flames

Covering 1,587 square kilometres, London Fire Brigade is one of the largest fire and rescue services in the world. With 4,853 uniformed operational firefighters, it is one of the busiest fire and rescue services in the United Kingdom. Improving the performance of its teams in the areas of fire prevention, fighting and community safety are key drivers for London Fire Brigade in its overall vision to become recognised as a world class fire service.

As one of the UK's primary fire and rescue services, thermal imaging technology development has been at the

forefront of London Fire Brigade's mind. Understanding that not all thermal imagers are the same and recognising the need to protect their front line crews, after rigorous testing, London Fire Brigade has selected Scott Safety as its chosen supplier of thermal imaging cameras.

London's firefighters are now equipped with the one of the most advanced thermal imaging cameras in the world, the X380. With its superior vision clarity, improving situational analysis in scenes when firefighters need it most, the X380 far outweighs its low cost competitors. The



▲ Andy Slater, Scott Safety (left) hands over the X380's to Gary Hopkins, LFB.

capabilities provided by the X380 will enable firefighters to interpret scenes faster and safer, making more tactical decisions, as they work to save lives in Britain's capital.

The hot and cold spot tracking capabilities – unique to the X380 thermal imaging camera – will enable firefighters to detect the hottest and coldest points of a fire or scene. This new capability means they can now find a fire source quicker, detect casualties and also navigate the safest routes in and out of a fire.

Gary Hopkins, Head of Research and Development, London Fire Brigade (LFB) said: "Ensuring the safety of our frontline crews is paramount. London Fire Brigade's investment in thermal imaging cameras is risk critical in providing a robust response to all emergency incidents, and ultimately, aid to a speedier conclusion."

"Advanced thermal imaging from Scott Safety is now a dominant technology platform in the fight to save lives and property" informs Andy Slater, General Manager, Thermal Imaging, Scott Safety. "This is due in part to the greater level of situational awareness it provides Firefighters compared to other cameras available; for instance with its hot and cold spot tracking capabilities. The X380 has continued to stand out during rigorous testing set by UK Fire & Rescue Services and it has become the firm favourite for improved visual awareness and firefighter safety."

## Lake Assault Fireboat to the rescue

A Lake Assault fireboat, owned and operated by the Lake Vermilion Fire Brigade, provided support for wildland firefighting efforts during the Foss Lake wildfire near Ely, Minnesota earlier this spring. The 33-foot craft was used to haul up to 20 person crews, and their canoes and equipment to staging areas to fight the blaze. The fire, located approximately 10 miles west of Ely, Minnesota in the Boundary Waters Canoe Area Wilderness, consumed a total of 936 acres and was contained and controlled on June 2nd.



For more information, go to [www.lakeassault.com](http://www.lakeassault.com)

## Power on the go

Seddon's Plant & Engineers Ltd will be showcasing two new Honda 110V Portable Generators on Stand E44 at this year's Emergency Services Show being held at the NEC in Birmingham, UK from 22nd – 24th September. The two new models – the Honda



EU10i 110V and the Honda EU17i 110V – are specifically designed for use by the emergency services including Fire and Rescue Services, Police and Forensics, the Ministry of Defence and other organisations involved in emergency prevention, response and recovery. The 110V Portable Generators provide clean, quiet electricity to run and recharge equipment and are ideal for applications such as powering LED lights or recharging batteries in emergency situations where no mains power is available.

Honda's state-of-the-art Inverter technology allows the EU10i and EU17i to remain much smaller and lighter than alternative models, allowing them to be super portable and carried with ease. They can be stored on emergency vehicles and easily carried to built-up areas or remote locations by one person. Although they are highly portable, they still remain very powerful and deliver stable energy that's even cleaner than electricity for the mains. The power delivered is free of surges or 'spikes' that can be detrimental in emergency situations.

Both the Honda EU10i 110V and the Honda EU17i 110V will be available to purchase at the show.

For more information, go to [www.seddonplant.co.uk](http://www.seddonplant.co.uk)

For more information, go to [www.scottsafety.com/emea](http://www.scottsafety.com/emea)



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**KEYNOTE SPEAKERS:**

**Vanessa L. Allen Sutherland** -  
Chairperson & Member of U.S. Chemical Safety Board

**Mu Shanjun** -  
Vice President of SINOPEC Research Institute of Safety Engineering

**Zhang Guangwen** -  
Senior Engineer of SINOPEC Research Institute of Safety Engineering





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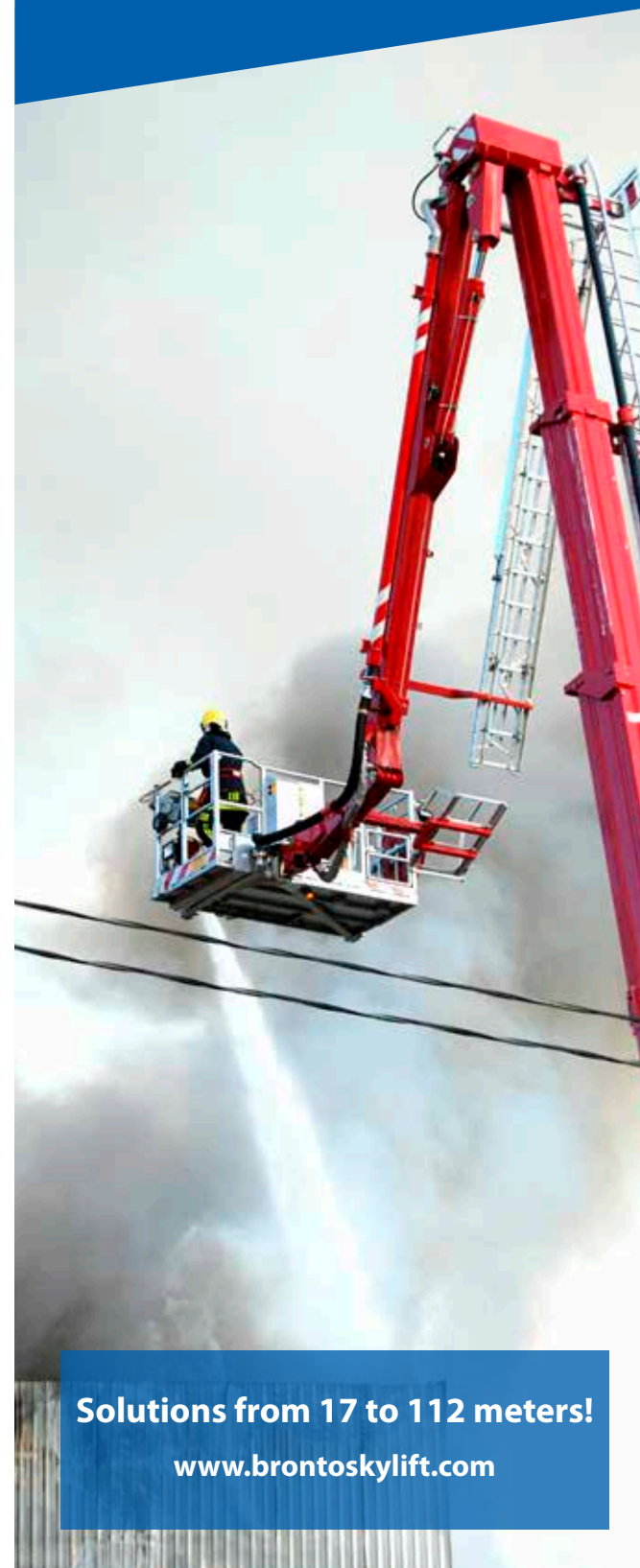
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# Cardiff Airport celebrates delivery of three Oshkosh Strikers

Tuesday June 28th 2016 was a day the children of Rhws Primary School will never forget, in particular three of it's pupils who were picked from numerous entries to officially name the recent delivery of the three Oshkosh Strikers to Cardiff Airport. Guests from the press as well as from other airports in the UK including Belfast, Liverpool, Swansea and Southampton attended along with delegates from Terberg and Jim Johnson, the President of Oshkosh's Fire & Emergency Segment all the way from Wisconsin.

**T**he decision to purchase three vehicles was made over a year ago, and was a joint decision by Cardiff Airport's Managing Director and Chief Operating Officer Debra Barber and Ray Imperato, Cardiff Airport's Fire Service Manager. The Oshkosh 6x6 Striker was identified as the vehicle of choice chosen primarily for its state of the art design as well as its functionality and the ability to carry 12,000 litres of water and

1,600 litres of foam. From its forward-facing bumper monitor, each striker can produce 60,000 litres of finished foam per minute with a jet throw of over 90 metres. To accompany each of the three Strikers, mounted on the roof is a High Reaching Extending Turret (HRET) system better known as the SNOZZLE®.

The three Strikers were ordered some months ago to replace the aging Boughton vehicles which have given Cardiff Airport a sterling service. With passenger numbers constantly on the increase and with various expansion projects in the pipeline, vehicles were needed that could cope

with the increase in demand should an incident occur. The Oshkosh Strikers have all the necessary acumen to attain and exceed the standards needed by a modern airport facility and some of the specifications these vehicles boast are truly impressive. These include but are not limited to, a top speed of over 70mph, independent suspension system with superior all-terrain mobility, and a turning diameter of just 23.8m.

Debra Barber Cardiff Airport's Managing Director and Chief Operating Officer spoke to the assembled guests and explained that the airport was

▼ Teachers and pupils from Rhws Primary School.

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Image courtesy of Michael Hall Photography





▲ Old meets new the Barracuda and the new Striker.

constantly growing, and the need to protect the safety and integrity of its passengers and staff as well as the firefighters themselves was paramount, and the Strikers ticked all the right boxes. Debra also went on to explain that with the size of investment the vehicles will be expected to last for a long number of years, which will be taken care of by Terberg Ltd, Oshkosh's UK dealer.

Jim Johnson President of Oshkosh's Fire & Rescue Segment also addressed the guests and explained that no Oshkosh fire truck is the same as every vehicle is 100% built by hand and tailored exactly to the customers requirements. Great pride as well as tradition goes into the construction of every vehicle that leaves their door and as part of the tendering process, Debra and Ray flew to the States to see firsthand, the progress of their soon to be new arrivals.



After a short demonstration of the Strikers capabilities a live burn prop was lit and then extinguished from the Strikers forward facing monitor. The HRET was also deployed piercing an aircraft fuselage and extinguishing the fire inside whilst keeping the crew a safe distance away from the fire.

After a spot of lunch, the three school children who had won the competition for naming of the three Strikers were presented prizes of model Strikers by Debra and Jim. The winning names were Merlin, Firefly and Y Ddraig Goch which when translated means The Red Dragon. Kelly Toshack who is the Deputy Headteacher at Rhws Primary School commented "The pupils thoroughly enjoyed the assembly the fire crew delivered which introduced the competition. It provided them with a real opportunity to learn more about fire safety and get creative by thinking and researching Welsh history, famous people and celtic icons. This helped them choose the new names for the fire vehicles."

◀ The three winners of the vehicle naming competition. The winning names were Merlin, Firefly and Y Ddraig Goch which when translated means The Red Dragon.



➔ For more information, go to [www.cardiff-airport.com](http://www.cardiff-airport.com)

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The inView product series also features powerful data management software allowing you to easily find the information you need and provides capability for proactive data searches to recognize and address potential problems before a major incident occurs.

The inView series features two primary packages;

- The inView 360™: a product focused on safety and accident avoidance with improved in-cab visibility

- The inView Guardian™: a product focused on liability protection and asset protection with video & data recording and vehicle tracking capabilities

### The inView 360™

The inView 360™ provides the apparatus driver with split screen view. The bird's-eye view is always visible providing a 360° view around the vehicle. This unique view allows the operator to see pedestrians and obstacles in close proximity to the apparatus or vehicle. The second view on the display switches between a front/left/right/rear view depending on the operational conditions. The system is networked between the turn signals and vehicle reverse so the screen automatically switches to left, right, and rear view when turning or backing up. An in-cab toggle switch allows the operator to override the default camera view for complete control over the system.

The inView 360™ video system has many options available to tailor the system for each apparatus in your fleet. All components incorporate durable design and construction suitable for emergency vehicle operations.



▲ Screen Shot of the inView 360 picture on the FRC- AVM 7.4" In Cab Monitor.

### The inView Guardian™

The inView Guardian™ captures both video and telematics data. Four long range cameras are used to provide a large area of video coverage of what is happening around the vehicle. The front camera is a HD camera providing excellent zoom capability to capture clear license plate information. This helps ensure you capture events leading up to any incident. In addition, video, speed, location and date/time information are captured through GPS and internal clock. The G-Force sensor captures impacts and hard braking information and all the data is stored on an internal memory which can be downloaded for PC viewing.

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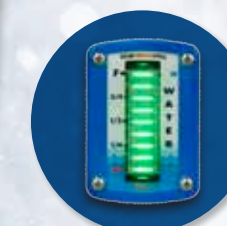


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# Jolly Scarpe SpA

## Professional footwear for over 30 years

**J**olly Scarpe SpA has been working in the world of professional footwear for over 30 years in support of those who dedicate their lives to the safeguarding of their community's citizens.

As well as dominating the UK fire-fighting market for many years with their wide range of innovative and long wearing fire boots, Jolly is successfully exporting fire boots to more than 30 countries worldwide.

Extensive research, advanced manufacturing techniques, innovative materials, safety, comfort and excellent customer service are the fundamental values which make Jolly Scarpe a world leader and true reference point for professionals working in this sector.

As with all great products, the secret is in the fine design detail and this certainly the case in Jolly structural fire-fighting boots. So, what are the innovative details that we are keen to promote?

▼ The latest evolution of Jolly structural fire-fighting boots exceeds all the original performance expectations.

### WBS – Wrap Band System – Prevents heel slippage

The new elasticated system is designed to allow a volume adjustment inside the foot area which creates a much improved fit for both feet and reduces the need for “special measures” or bespoke manufacture. The system is especially suitable for female firefighters and supersedes the old technology regarding heel grips.

### Inner Air-Flow System

The EN15090 Standard clearly states that for fire-fighter's footwear the stringent testing is carried out on the full height of the boot, including tear resistance, radiant heat and flame resistance, water penetration and absorption. Jolly fire-fighting boots are designed to offer the highest protection and so our new aeration system allows the air between the upper and the GORE® linings to easily and naturally flow in and out through the air-mesh of the collar.



### J-Morphic Last Features

In order to reach the highest level of SRC (slip resistance) Jolly has developed for all its fire-fighting and search & rescue boot collection a new outsole, shaped on the new J-Morphic last. The outline of this last offers a much more rounded profile offering a major improvement to most other boots on the market with their more traditional “flat” outsole systems that use metallic anti-perforation insoles. The benefits are:

- The profile is superior with a wider toe box that prevents toe cramping.
- The rounded heel eases the foot during the roll-over phase of walking avoiding scuffing of regular sharp-edged designs and ensures high levels of slip resistance.
- A better roll-over motion that allows the shoes to perform 90% of each step without bending the outsole thus reducing creasing stress on the bonding and preventing wrinkles being produced in the uppers which can cause pressure points on the foot. The walk will be more comfortable, the foot less stressed and the muscles more relaxed.
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A 20 year veteran of the UK fire Service was pleased to announce to us following years of wearing the Jolly fire-boot, “the shape of this boot inside and out gives me the sensation that the boot is a part of me and I can stand longer and walk further... they make me feel like running!”



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Image courtesy of Jolly Scarpe



# The Turbinator from Knowsley SK

## Always providing precision proportioning

**I**n-line water driven foam proportioning pumps have become more and more popular in the last decade. Their low pressure drop and accurate foam proportioning over a wide range of flows are necessary in many systems. But this technology is not simple: the equipment on the market until now is quite complicated and sensitive to contamination and over speeding. The new Turbinator water driven foam proportioning pump developed by Knowsley SK effectively solves these problems, making this technology the preferred choice for a wide range of fire fighting systems.

### Precision proportioning – Always

The Turbinator is a positive displacement foam proportioning pump designed for Fixed and Mobile applications. The unit is driven by a special volumetric water motor which is directly coupled to a precision

gear foam pump. Because both parts of the Turbinator are positive displacement devices, the ratio of foam concentrate to firewater is fixed over the full operating range. This makes Turbinator the ideal proportioning technology for systems with different flows, such as multi-legged deluge systems, sprinkler systems and mobile large incident equipment.

The Turbinator unit does not require setting up or on-site adjustment – the proportioning rate is achieved at any flow rate and pressure within the operating range.

### Technology built to last – Forever

With Turbinator technology, Knowsley introduced a flexible, abrasion resistant paddle material in the water motor which gives the unit its unique wear characteristics. The usual contamination present in fire water does not damage the paddles. Overspeed up to 120% of the nominal flow, which can occur during automatically controlled activation of large systems, does not damage the unit. In addition, the Turbinator resists dry running in accordance with NFPA20.



▲ MAXI Turbinator installed on fixed skid feeding foam pouring systems on storage tanks and bunds.

### Design and installation: Simple as 1-2-3

The close-coupled design offers a very compact and efficient installation with just three connections: fire water inlet (1), foam concentrate inlet (2) and foam solution outlet (3). The unit can be installed directly into vertical or horizontal piping systems. The Turbinator foam pump delivers 3m suction height easily, which makes it possible to install the foam concentrate tank below the unit installation level – even with high viscosity concentrates in arctic conditions (thick foams). Simple, cost effective atmospheric foam tanks are fine for Turbinator.

With its unique low differential pressure, Turbinator fits in the most complicated systems, even when long pipe runs or static pressure loss are involved. Turbinator does not require external power supply or control circuits and is safe for any ATEX environment.

The Turbinator is available in 3 sizes from 500 l/min to 12'000 l/min with proportioning of 1% and 3% with freshwater and saltwater construction. Each Turbinator built in our Manchester, UK factory is 100% functionally tested on a high flow test rig through its whole operating range ensuring functionality at all times.

▼ For more information, go to [www.knowsleysk.com](http://www.knowsleysk.com)



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## Firefighting foam concentrates – the constant evolution: Part 1

In the last decade there have been many advances in foam for firefighting. Since 2001 the multinational 3M ceased to manufacture surfactants and fluorinated AFFF foams due to the ban on PFOS (perfluorooctyl sulfonates), a flurry of development has been carried out by manufacturers of fluorinated derivatives and foams.



**Javier Castro**

**Javier Castro has been in the fire business from 2001. He has led all R&D activities on firefighting foam concentrates for Auxquimia, from AFFFs to Fluorine free over more than 15 years. Over this period of time he has developed some special products designed for very specific applications. He has been directly involved not only in product development, but very active on technical consultancy, always very close to end user's needs. Mr. Castro holds a chemical Engineer Degree from Oviedo University and he has been deeply trained over his career on QHSE, Finance and Management amongst others.**

**T**he ban of PFOS required by an European and American Regulations, the decreasing of chains length (from 8 to 6 carbon atoms) in the fluorinated materials to reduce precursors of PFOA, the different proposals to limit the PFOA levels or even the regulation on the use of halogenated organic compounds in some countries have made the market of foams for firefighting very dynamic with changes on legislation, development of new products, etc. in the last decade. The fluorine-free foams (Fluorine Free, 3F, FFF) have become very important in recent times, in some cases even as substitutes for AFFF agents, being the subject matter of controversy and discussion in all international forums.

In addition to new formulations and

types of foam, new testing standards have been developed and modified seeking test conditions as representative as possible of the real risks. Examples of this are the widely accepted protocol LASTFIRE tests as a requirement of foams in the petroleum industry or changes in the ICAO standard for airports. The European standard EN-1568, has been revised in 2008 and it has introduced new test fuels with respect to 2001 version; a new revision is on approval process and it will be published soon.

New fuels have gained importance in recent times, such as ethanol or gasoline with polar solvents as additives (e.g. the ethanol itself, MTBE, ETBE, etc.) which converts one specific type of hydrocarbon fuel in a complex mixture of hydrocarbons and polar solvents whose behaviour in contact with a foam solution has special features that should be taken into consideration.

The use of CAFS (Compressed Air Foam System) and the use of electronic foam proportioning systems have been

▼ Fire testing ground in Auxquimia's facility, Spain.







Images courtesy of AUXQUIMIA S.A.U.

▲ EN-1568-3:2008. Forceful application over heptane.

a major technological breakthrough in the industry of fire fighting. These systems are more efficient and allow a precise control of dosage, even at very low proportions rates (0.1-1%).

Throughout this article we will briefly review the changes in the foam sector to fight fires in the last decade, especially in the following fields:

1. Testing Standards
2. Environmental regulations
3. Fuels
4. Foam Concentrate
5. Fire-fighting Systems

### 1. Testing Standards

Until 2001, when the European Standard EN-1568 unified the criteria for approving and evaluating the foam concentrates, each country used its own standards, what made very difficult to compare the quality of foam concentrates manufactured in different countries.

Since 2001, the reference standard in Europe for testing and qualification of foam is the standard EN-1568, which consists of four parts:

- EN-1568-1: Fire extinguishing media. Foam concentrates. Specification for medium expansion foam concentrates for surface application to water-non miscible liquids.

- EN-1568-2: Fire extinguishing media. Foam concentrates. Specification for high expansion foam concentrates for surface application to water-non miscible liquids.
- EN-1568-3: Fire extinguishing media. Foam concentrates. Specification for low expansion foam concentrates for surface application to water-no miscible liquids.
- EN-1568-4: Fire extinguishing media. Foam concentrates. Specification for low expansion foam concentrates for surface application to water-miscible liquids.

In 2008, a new version replaced the original edition from 2001. The most significant changes between the two versions are:

- Definition of the material for the testing pans (Stainless Steel).
- Clarification of the requirements for a product to be classified as IA according to EN-1568-3, especially in the French version of the standard.
- Introduction of a new fuel on the fire tests of Part 4 (Isopropyl Alcohol).

The standards EN-1568-1: 2008 and EN-1568-2: 2008 do not establish classifications for products, only the fulfilment or not of the standards themselves. However parts 3 and 4 (EN 1568-3: 2008 and EN 1568-4: 2008) establish a classification of products according to their performance on the fire, both in extinguishment and in re ignition. For this reason, it is not enough to establish as requirement the compliance with these standards, but it should be indicated the minimum classification required for each individual part of the standard applicable (3-4).

Below we make a summary of the possible classifications for foams according to these standards:

#### EN 1568-3: 2008

- I: Extinction capacity by forceful application to hydrocarbons.
- II: Extinction capacity by forceful application to hydrocarbons when the application of the foam is interrupted (slow extinction).
- III: Extinction capacity with hydrocarbons by gentle application.

◀ EN-1568-3:2008. Gentle application over heptane.



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Image courtesy of AUXOMMA S.A.U.

▲ **EN-1568-4:2008. Acetone test.**

Once the extinction test has been carried out, it is performed a burn back test to measure the level of protection that the foam is able to provide after extinguishment. There are four classifications (A, B, C and D); A indicates the highest level of resistance and D the lowest.

A product that meets the standard EN-1568-3 can be classified between class IA (maximum) and class IIID (minimum), it can be also classified in the intermediate range of classes between class IA and class IIID.

**EN 1568-4: 2008**

On polar solvents, tests are performed only with gentle application and the classifications are as follows:

- I: if extinction time is below 3 minutes.
- II: if extinction time is longer than 3 minutes.

In this case, it is also carried out a burn back test to determine the resistance of the foam, being the class A for those foams with longer burn back times and the class D for the shortest.

The new version of 2008, in addition to the acetone test, has incorporated a test with isopropyl alcohol (IPA). Some foams with good behaviour on acetone are very poor in other polar solvents such as IPA. For this reason it was decided to keep both fuels in the standard in order to have

a more realistic range of behaviours of the foam. It must be pointed out that the rankings may be different for both fuels, e.g. the same foam can be rated as IA with acetone and IIB with IPA.

\*\*\*\*Those users who want to have premium quality products, which are capable of dealing with any hazard of liquid fires with guarantees, should demand products rated IA or IB according to EN-1568-3 / 4:2008.

Along 2016 is expected to be published a third version of EN-1568, which will include new classifications, reference to Fluorine Free Foams and some ecotoxicological data.

Until the appearance of standard EN 13565-2 ("Fixed firefighting systems. Foam systems, design, construction and maintenance") in May 2009, the different classifications according to the test standard EN-1568 had no impact in the design of firefighting systems. EN 13565-2, depending on the classification of the foam according to the standard EN-1568 i.e. depending on the quality of the foam, settles the application rates to be used, "rewarding" those products with a higher performance at lower application rates. It also takes into account what type of system to use (foam cameras, monitors, spears manuals, etc.) in the design of operating conditions.

**UL-162**

UL listing based on the standard UL-162 (Foam Equipment and Liquid Concentrates) is a worldwide recognized standard for testing firefighting foam

concentrates. The laboratory which manages this certification, follow-ups, etc. is Underwriter Laboratories Inc. (UL).

The main difference with other standard for foams is that UL-162 not only describe a fire testing method for foam concentrate but also a "compatibility" confirmation between all the components that are present in the "chain" from the manufacturing process to the final use of the product; compatibility with drums, proportioning tests, foam quality tests, marking, etc. are subjected to the standard. Additionally, a follow up is required in a quarterly base; samples of concentrates and containers are taken and sent to UL laboratories for verification.

The listing or certification process for UL-162 is more complex than for other standards as EN-1568, ICAO, LASTFIRE, etc. with which only physic-chemical properties and fire tests are analyzed in fixed conditions. UL-162 requires to conduct foam quality tests with commercial equipment (UL listed) in order to verify foam quality previously to fire testing.

For the above, the customers who require UL listed concentrates are not only demanding a fire performance (which is covered by other standards) but also for a product with a performance of the foam when it is used with a specific type of equipment and which is subjected to periodically controls by an external body, assuring homogeneity along the time with not formulation or packing changes out of control.

According to UL-162 there are 3 different applications that a foam concentrate can be listed with:

- Sprinklers and Spray Nozzle (point 9)
- Topside Discharge Devices (point 10)
- Subsurface Injection (point 11)

Each type of application has a different testing method.

The most common and the normal requirement is the Topside Discharge defined as "A method of foam discharge wherein the foam is applied onto the top of burning fuel surface". This type of discharge includes monitors, hand nozzles, foam chambers, etc.

Full-scale equipment ("field installed components, such as proportioners and foam makers that are intended to extinguish fires") should be selected for

# Our employees fight fire and so do our products

*My name is Magnus.  
I am working with product development at Fomtec.  
This picture is from a fire test in Sweden. Follow us if you want to find out more about me, the Fomtec way and all our products.*

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TABLE 3 – FOAM APPLICATION AND BURNBACK IGNITION

Application	Foam Concentrate	Fuel Group	Test application density, gpm/ft2	Time of foam application, minutes	Duration until burnback ignition, minutes	Minimum Design application density, gpm/ft2
1. Type III Discharge Outlets	P, FP, S, FFFP, AFFF, FFFP	Hydrocarbon Hydrocarbon	0.06	5	15	0.16
			0.04	3	9	0.10
2. Type II Discharge Outlets	P, FP, S, FFFP, AFFF, FFFP, All	Hydrocarbon	0.06	5	15	0.10
		Hydrocarbon	0.04	3	9	0.10
		Polar	b	5	15	c

TABLE 4 – FUELS FOR POLAR SOLVENT TEST

Polar Solvent Group	Standard Test Fuel
Alcohol	Isopropyl Alcohol
Ketones	Dimethyl Ketone
Esters	N-Butyl acetate
Carboxylic Acids	Glacial Acetic Acid
Amines	Ethylene Diamine
Aldehydes	Propionaldehyde
Ethers, except Diethyl and Methyl Tertiary Butyl Ether	Isopropyl Ether
Impurities for any polar test fuel is not to exceed 1.0 percent	

the listing process with the concentrate. Both proportioner and foam maker should be UL listed for the operation conditions that will be used in the tests.

The fire tests have to be conducted with a nozzle which gives approximate same expansion and 25% drainage time

of the full-scale equipment (tolerances are detailed in the standard). Depending on the equipment selected, the foam quality generated will have different properties so fire performance can be also difference; non-aspirating monitors, which have an excellent reach, produce pourer foam quality than aspirating hand nozzles; with non-aspirating devices the foam concentrate quality should be high quality to pass the UL-162 tests.

▼ Type III foam discharge.



Images courtesy of AUXQUIMIA S.A.U.

Fire Tests Topside discharge

The UL-162 establishes two different topside application discharge outlets:

- Type III: For portable or fixed devices that delivers foam directly onto the fuel surface causing general agitation (monitor, hose stream nozzles, etc.).
- Type II: Fixed devices that deliver foam in a “gentle” manner (foam chambers, foam makers, etc...)

The hydrocarbons fire tests are conducted using heptane. The discharge type and application rate depends on the type of product (Proteinic, Fluoroproteinic, Synthetic, AFFF, FFFP) according to table 3.

In case of polar solvents, there is a reference fuel for each type of chemical structure (see table 4). Only Type II application can be listed for polar solvents and the application is selected by the manufacturer and should be indicated in the listing certificate. Note that MTBE requires a specific tests to be considered listed with this fuel.

Each foam concentrate only can be delivered with the container which is listed with. It is not allowed to mark with UL logo packing not approved or those that not meets UL-162 requirement for example totes or IBC.

LASTFIRE

For the oil industry, the greater risk of fire comes from the large hydrocarbon storage tanks, where are stored large tonnages of liquid fuel products. The LASTFIRE test protocol simulates the difficult conditions that occur during a fire in a storage tank, such as the longer time of pre-combustion, metal sheets with great thickness at high temperature, etc. as well as various types of foam application that can be used to

► Type II foam discharge.

extinguish the fire, from the use of aspirated or non-aspirated monitors to the fixed systems. The protocol sets three types of tests:

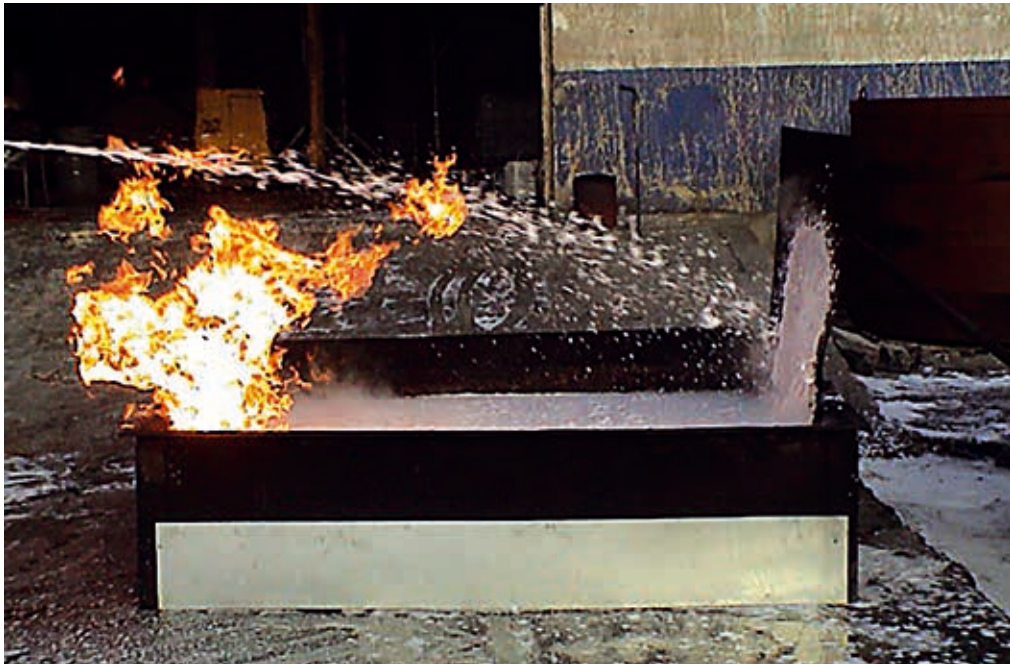
- Semi-aspirated: Simulates foam application with non-aspirated monitors.
- Aspirated: Simulates foam application with aspirated monitors.
- System: Simulates foam application with foam chambers.

According to this protocol and for each test, the foams obtain different scores depending on fire control time, extinguishing time, vapour suppression and burn back resistance. Then as a result of the obtained score, the products are classified as “Good”, “Acceptable”, “Reduced” and “Poor” Fire Performance. The compliance for the petrochemical industry to LASTFIRE protocol should be acceptable or good rating in all three types of application.

Airports, through the International Civil Aviation Organization (ICAO), has also been active in updating their testing procedures; These changes have been approved in 2013. So far, two levels of foam quality were established: Level A and Level B. Every airport, according to its category and its firefighting equipment must use foam of one of those two levels. Since every time planes seem to get bigger, therefore the risk is also increasing, a new level in the certification for foams has been created, level C, which makes possible to extinguish fires with larger surfaces using the same equipment.

Apart from the introduction of the new level C, the protocol has changed slightly and will not allow the movement of the nozzle throughout the test, which makes extinction more difficult. By contrast, the standard will allow longer time for extinguishment (From 1min to 2 min.)

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**"SEAC considers that fluorine-free foams can be taken into account on a long-term basis but cannot be relied on for the coming years for such a critical use."**

Committee for Socio-economic Analysis (SEAC), Draft Opinion, on an Annex XV dossier proposing restriction on PFOA, its salts and PFOA-related substances, 10 September 2015, p14.

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# What's new with... Foam concentrates

With the greatly increased emphasis on firefighter safety, the leading manufacturers have boosted their research and development efforts to provide the end user with the safest, most efficient and reliable foam concentrates. In this Buyer's Guide we highlight the latest offerings from the worlds leading suppliers.

## 3F Foams

For the past ten years the fire industry has been struggling to find the answer to the environmental issues surrounding foam concentrates. But now, following four years of research and

development 3F are clearly on their own when it comes to new generation products. 3F have now developed into Europe's leading manufacturer of technologically advanced foam concentrates. 'Solvent Free' technology was developed by 3F to reduce by 50% the COD and BOD of fire-fighting foam. This technology known as Smart Foam has been introduced to foams that contain fluoro surfactants and foams that are Fluoro Free, to provide a further environmental benefit for the end user.

In terms of both fire performance and lowest environmental profile, 3F are the first manufacturer in the world to introduce 'Fluoro Free and Solvent Free' foam to the industry. FREEDOL SF is the first FFF-AR of its kind using this technology and proving to the market that AFFF and AFFF-AR can be replaced when required. Another first is FREDEX SF1, the only 'Fluoro Free and Solvent Free' foam approved to EN3 for Class B and Class A with two of Europe's leading extinguisher manufacturers for use in stored pressure and cartridge extinguishers. This new Smart Foam product is now approved with a Chinese manufacturer to the Australian and New Zealand standards and will continue to expand into other world markets in the coming years.



For more information, go to [www.3fff.co.uk](http://www.3fff.co.uk)

**3F**

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## Angus

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In addition, Angus has released a range of fluorine free products for applications where environmental pressures are paramount. Angus Jetfoam is the first fluorine free, aviation foam to pass all aspects of ICAO Level B (fire and physical performance) and the only fluorine free foam capable of film formation on aviation kerosene.

The Respondol ATF is the brand new fluorine free foam from Angus Fire. A superior quality foam concentrate, designed for extinguishing and securing all types of flammable liquid fires and Class A incidents. Respondol ATF is a patented combination of surfactants and other ingredients specifically designed for general emergency responders who are faced with a variety of risks in a range of situations. Angus Respondol ATF is approved to EN1568 part 3 and 4 on all fuels and with all water types.

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Dafo Fomtec AB is a producer and supplier of firefighting foams, powders and equipment. We are an independent and privately owned company with head office in Stockholm and production in Helsingborg in Sweden.

We are dedicated to high quality and high performing firefighting products to fulfill your demands. Many of our products have international recognized approvals such as: UL, FM, EN 1568, ICAO, IMO, MED and so on. During the years, we have put a lot of resources and effort in research and development to continuously improve our product portfolio – both regarding performance and environmental profile. As a part of this work, we perform annually over 300 full size fire tests where new products are put to the limit before they are sent for approval and placed on the market.

Our product portfolio consists of a wide range of products of all kinds and for all markets. The film forming AFFF- and AFFF-AR foams have been successfully transferred to the short chain C6-fluorosurfactants. Their performances have been evaluated in full scale fire tests before released to the market. In the range you also find protein-based foams, such as P-, FP-, FFFP and FFFP-AR types. We also offer a wide range of fluorine free foams – marketed with the name Enviro. Here you find Class A foams, multipurpose foams and FFF-types. The latter being fluorine free foams with high fire performance to be an alternative for AFFF- and AFFF-AR types. We also offer different types of foam solutions (premixes) as well as training foams – the latter especially designed to have as small environmental impact as possible.

For more information, go to  
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# CHEMGUARD

## PROFOAM

PROFOAM is specialised in production of firefighting foams. Years of innovative research have resulted in the development of more than twenty unique products, protein and synthetic based, adapted to a wide range of international firefighting requirements.

The production plant is located at Novara (near Milan Italy) in the heart of Europe, allowing an easy access to most countries around the world. What sets us apart is having a substantial production facility (200m3 with adequate supplies of foam concentrate).

Large production capacity, quality products, knowhow and reliability distinguish PROFOAM as the universal leader of foam manufacturers, giving the professional end user the quality assurance they need where matters of safety are paramount.

For the oil industry we recommend the use of protein based foam compounds (FP, FFFP, ARFP), as they provide superior burnback resistance, as well as being kinder to the environment. Besides in places where sea water is used for firefighting, protein foam compounds work more effectively with sea water than synthetic foams.

## Dynax

Founded in 1991, Dynax is a leading producer of fluorotelomer-based surfactants and foam stabilizers used in fire-fighting foam applications. As a result of the SBIR project carried out for the Air Force, Dynax developed environmentally more benign AFFFs and proposed higher performance standards for Mil-spec agents. Dynax also developed the first polymeric foam stabilizer (C6≥99%), making it possible for customers to produce low-viscosity or Newtonian AR-AFFF.

Dynax fluorochemicals, all derived from a high-purity short-chain (≤C6) fluorotelomer intermediate, neither contain PFOS and nor degrade into PFOS or PFOA.

With more than 90 years of combined experience in the fire-fighting foam industry, Dynax's expertise includes the development of new and innovative fluorochemicals and technical support to foam agent producers.

Today, as one of the largest producer and supplier of specialty fluorochemicals to the fire-fighting foam industry, Dynax continues to develop benchmark products to further strengthen its growing leadership.

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# dynax

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We are producing top-performance foam without the use of C8 chemistry to the point that, in 2015, our US branch even qualified our C6 formulation for a 3% AFFF that met US military specification MIL-F-24385, which is currently listed in the QPL Directory as Phos-Chek 3% AFFF MS. This was the first C6 fluorochemical foam concentrate to be listed in the QPL in accordance with the US Environmental Protection Agency's Stewardship Programme – no small achievement considering this certification is the most demanding in the world for AFFF's.

Our range of fluorine-free foams UNIPOL-FF has been evolving through the years to cover most industrial and civil applications. In 2011 it achieved a rating of 1B in Heptane and 1A in acetone on EN-1568:2008, in 2012 it achieved LASTIFIRE certification and in 2015 UNIPOL achieved UL 162 listing (Standard for foam equipment and liquid concentrates) with polar solvents, an extraordinary achievement given that all other fluorine-free foams have only been listed with hydrocarbon fuels.

Furthermore, sprinkler tests based on the same protocol with UNIPOL-FF-3/6 were also carried out with the challenging polar solvents acetone, ethanol and isopropyl alcohol, and the results again showed very good extinguishing times. Our foams are under constant development and we have set ourselves some further challenges for the future.

For more information, go to  
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FireChem's reputation for Quality and Reliability is widely acclaimed and its products meet various National and International Standards. The product quality is further endorsed

## Solberg

Solberg is your one-stop resource for high performance, sustainable firefighting foam concentrates and custom-designed foam suppression systems hardware. Solberg has the expertise, capabilities and resources to serve the high-hazard, high-risk market sector globally.

RE-HEALING™ Foam concentrates from SOLBERG are an innovative, high fire performing environmentally sustainable fluorosurfactant and fluoropolymer-free firefighting foam used to effectively extinguish Class B fuels with no environmental concerns for persistence, bioaccumulation or toxic breakdown. RE-HEALING foam concentrates are very effective firefighting foams for flame knockdown, fire control, extinguishment, and burn-back resistance. Control, extinguishing time, and burn-back resistance is paramount to the safety of firefighters everywhere.

RE-HEALING foam concentrates have shown excellent performance in each of these categories. Concentrates are available in 1%, 3%, 6% 3x3% ATC and 3x6% ATC formulations.

ARCTIC™ AFFF, C6 compliant foam concentrates are intended for use on Class B hydrocarbon fuel fires and are available in 1%, 3% and 6% concentrations. ARCTIC ATC™ foam concentrates are intended for use on Class B hydrocarbon and polar solvent fuel fires. Concentrates are available in 1X3%, 3x3%, and 3x6% ATC formulations.

FIRE-BRAKE™ foam concentrate is a synthetic firefighting foam concentrate specially designed to be used for wildland, structural and other Class A fuel fires. The foam concentrate is biodegradable and non-toxic, so it is environmentally sustainable. FIRE-BRAKE foam concentrate is proportioned at a rate of 0.1% – 1.0%.

SOLBERG brand foam suppression systems hardware is engineered by a team with over 225 years of combined in-the-field fire protection experience. As a custom manufacturer, we tailor firefighting hardware to meet your particular specifications. You can count on us to work with you and deliver products that perform as needed, when you need them.

For more information, go to  
[www.solbergfoam.com](http://www.solbergfoam.com)



by certification agencies like – Underwriters Laboratories (UL), Germanischer Lloyd (GL), Det Norske Veritas (DNV), Lloyd's Register (LR), Bureau Of India Standards (BIS) etc. FireChem is certified to ISO 9001 Quality management system and ISO 14000 for Environmental Management System.

FireChem is in a position to offer any type of Foam Fire Extinguishing Concentrate which can comply International Standards like UL 162, US Mil Spec, ICAO Level A & B, UK Defence, EN 1568, GL, IRS etc.

For more information, go to  
[www.fcfsd.com](http://www.fcfsd.com)



## BIOex

Since 1998, BIOex has designed and manufactured the latest generation of ecological foam concentrates and also produces conventional foams for use in firefighting operations – solid class A fires, liquid class B hydrocarbon fires, liquid class B polar solvent fires and toxic gaseous vapors.

- 2002 – At BIOex we were convinced of the harmfulness of fluorine derivatives and were already working to preserve our environment by launching ECOPOL, the first fluorine-free multi-purpose foam concentrate.
- End of 2015 – We launched the new formula ECOPOL F3 HC specially developed to create the first fluorine-free 3% foam concentrate with an exceptionally fast extinguishing action on hydrocarbon fires.

Specializing in the design and production of ecologically friendly 100% fluorine free foam concentrates; BIOex has launched a new formula – ECOPOL F3 HC. THE first fluorine-free 3% foam concentrate for hydrocarbon fires that performs better than the best AFFFs.

### Ecological

- Fluorine-free 3% foam concentrate
- Readily biodegradable

### Exceptional Extinguishing Performance

- Used at 3% in direct application on hydrocarbon fires
- Obtained the best 1A performance classification under EN 1568-3 standard by an independent recognized laboratory (certified 1A/fresh water – 1A/sea water)
- Obtained the best performance classification under LASTIFIRE – Good-Good-Good

### Effective On Hydrocarbon Fires

- Exceptionally fast extinguishing action on hydrocarbon fires
- Very long burn back time equal to the best protein foams!

### Powerful Foaming Capability:

- Offers durable adherence on vertical surfaces
- Insulates of storage containers in case of fire nearby

See the video ECOPOL F3 HC versus AFFF at  
<https://www.youtube.com/watch?v=oVZOWMHsnYs>

For more information, go to  
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## BIOex Foam concentrates



NEW

**ECOPOL F3 HC**

## Ecological foam concentrate for Hydrocarbon fires

- ▶ More effective than the best AFFFs
- ▶ Equal resistance to protein foams
- ▶ EN1568-3 certified:  
1A at 3%
- ▶ LASTIFIRE certified:  
Good-Good-Good
- ▶ Fluorine-free



[www.bio-ex.com](http://www.bio-ex.com)



## Dr Sthamer – Hamburg

As Europe's foremost Fire Fighting Foam Manufacturer, Dr Sthamer – Hamburg has been developing and producing foams since the 1920's. Dr Sthamer is a Hamburg based independent family owned business founded in 1886.

Dr Sthamer have been formulating firefighting protein and fluoro-protein based foams as well as AFFF, AR-AFFF and Fluorine Free Foams.

Their latest generation foams are divided into 3 product families:

- Fluorinated AFFF and AR-AFFF using the latest C6 Carbon chain fluorosurfactants in full compliance with the US EPA 2015 requirements and the EU 757/2010 POP (Persistent Organic Pollutants) Directives. These foams are independently tested and certified by 3rd party laboratories to EN1568, UL, IMO, MED, ICAO LASTFire Etc.
- Fluorine Free Foams, AR-Fluorine Free Foams, Class A 0.5% and 1% Foams, CAF's Foams, High Expansion Foams and Wetting agents all with 3rd Party Independent certification.
- Protein based foams, including FluoroProtein foams with UL Listing, EN1568 and IMO1312 approvals.

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## Orchidee

Orchidee is a leading European developer and producer of a wide range of firefighting products. Orchidee Foams, Powders, and Water Additives are marketed worldwide and its Orchidex and Pulvex brand names are a symbol of quality and Performance.

Orchidee is the preferred supplier to a wide range of customers across many industries, and across the globe. These include, the world's leading manufacturers of portable extinguishers, fire brigades, large industrial companies, oil refineries, electricity plants, storage farms, airports, oil & gas exploration, military and others.

The company's in-house R&D division is continually advancing the industry with cutting edge products that are breaking new ground in terms of performance and biodegradability. In 2010, Orchidee introduced BlueFoam to the market, a top performance fluorine-free foam, which is setting new standards of environmental & safety.



## Williams Fire & Hazard Control

The Williams Fire & Hazard Control business boasts a successful history of responding to over 200 industrial fire incidents throughout the world. Such success inspired a full line of specialized response equipment including high performance nozzles, high-flow transportable firewater pumps and monitors, foam concentrates, mobile response trailers, foam proportioning systems for field use and fire trucks, dry chemical extinguishing packages and advanced storage tank protection. From storage tanks and pipeline emergencies to offshore platforms and vessels at sea, response personnel and specialized equipment stand ready to respond to the industry's worst fire emergencies.

The front-line experience of the Williams Fire & Hazard Control firefighting team is the driving force behind the development of the THUNDERSTORM foam concentrates we use to help protect what matters most.

THUNDERSTORM AR-AFFF foams offer the industry's best performance on both hydrocarbon and polar solvent fires, and our application methodology, equipment designs, and response success have all been predicated on that superior performance. Since its introduction to industry in 2000, THUNDERSTORM 1x3 AR-AFFF foam concentrate has become the gold standard in industrial foam caches around the world in a variety of facility types, helping to protect raw and finished product in refining, storage, transferring and transportation environments.

For more information, go to [www.williamsfire.com](http://www.williamsfire.com)



Our products are developed in accordance with the highest international safety & environmental standards.

The company's ongoing R&D drives the ingenuity and top performance of every Orchidee product, making Orchidee a leading name in the world of firefighting products.

Our products have an outstanding shelf life, and we offer a variety of packaging configurations according to the customer's request.

For more information, go to [www.orchidee-fire.com](http://www.orchidee-fire.com)

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### FOAM CONCENTRATES

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- Fluoro Protein Foams (FP)
- Film Forming Fluoro Protein Foams (FFFP)
- Alcohol Resistant Aqueous Film Forming Foams (AR/AFFF)
- Alcohol Resistant Film Forming Fluoro Protein Foams (AR/FFFP)
- Class A Foams
- Protein Foams & Hydrolysates
- Fluorine Free Foams
- HAZMAT Foams

### EQUIPMENTS

- Bladder Tanks
- Foam Chambers / Pumps
- Hand Line Nozzles
- Water Mist Backsweep System
- Fire Extinguishers - Dry Powders
- Fire Extinguishers - Clean Agents
- Fire Extinguishers - Carbon Dioxide
- Fire Extinguishers - Wet Chemical

### DRY CHEMICAL POWDERS

- BC Powders Sodium Bicarbonate Based
- BC Powders Potassium Bicarbonate Based
- ABC Powders Mono Ammonium Phosphate Based
- Class D Powders
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# Offensive fire attack – Variables that interfere with the fire gases outlet: Part 2

In the article published in the previous issue, we did a description of the fundamentals of the exterior offensive attack technique, establishing that its effectiveness depends on three different aspects: Interfering as little as possible in outgassing, thus avoiding changing the dynamics of gas flow, to generate as little water vapor as possible, to effectively cool solid fuels. The variables related to the obstruction of fire gases outlet by water stream (and the air it drags) projected inward have been discussed in the previous article. Now we will try to describe what happens inside the room on fire.



Pablo Boj

Pablo Boj is a professional firefighter in Malaga Fire Department (Málaga, Spain) since 2002, and crew commander since 2008. Pablo holds a degree in Criminology and his work has been focused on the field of fire investigation and fireground tactics.

## Water dispersion and effectiveness

In a confined fire we can make a simplification of the elements involved: the fuel that feeds the fire, the layer of hot gases from the combustion and the enclosure that surrounds and contains them. We start from the premise that in order to be able to decrease the intensity of fire, the water should reach the fuel feeding that fire. Furthermore, we should avoid

▼ In the discussion of the assumptions, the design and realization of tests, a large number of firefighters participated.

changing the dynamics of hot gases flow, minimizing where possible the generation of steam, namely the one generated when water traverses the gas layer or when getting in contact with structural elements that do not contribute to fire (walls and ceiling, provided they are not covered or coated by combustible materials).

The straight stream projected into a room against the ceiling goes through the gas layer without suffering significant vaporization due to the small surface that the water body exposes. Once it breaks against the ceiling, it loses kinetic energy by drawing a dispersion pattern that varies



Image courtesy of Pablo Boj

► The behavior of water after reaching the ceiling depends on its speed and angle of impact.

depending on the speed and the angle at which it reaches the ceiling.

Once again we have the influence both of the delivery pressure, which shows up in the speed with which the water leaves the nozzle and of the entrance angle of the jet into the room. When water reaches the ceiling, it spreads and slips under it, being this movement more horizontal the faster the speed of the jet and the smaller the angle of entry, what means more time in the layer of gases, and therefore a greater vaporization in this area. In addition, faster speed causes greater dispersion of water and drops of smaller diameter.

As a result of gravity and disaggregation, the water ends by rushing towards the ground dropwise. The size of these drops, as they traverse the layer of gas while falling, is decisive in the degree of vaporization, being preferable large drops against mist, since the smaller size, the bigger surface exposed to heat and the bigger residence time in the gas layer, which means that less liquid water will reach the solid fuel at lower levels.

Finally, water will fall vertically on fuels or on the ground, or it will impact on the walls. In this respect, we should minimize the amount of water reaching walls, as water will use its cooling capacity on them by generating steam and then it will drain into the lower planes, where it will accumulate without any effect on fuel.

## Trials conducted

In order to study all these aspects, several trials have been conducted in the facilities described in the precedent article.

Trial 3. In the same room, we project water inwards, with different configurations of pressure, flow and operating position in respect to the façade, making an observation of the water spraying on a water sheet on the floor.

## Results and discussion

Results of Trial N.3 allow us to make the following statements:

- The higher pressure and the lower entry angle, the greater distance reaches the water projection.



- The greater angle of entry, the greater dispersion in the axis perpendicular to the projection.
- The lower pressure and the higher actual water flow, the thicker drops confirmed by direct observation.

In respect of water dispersal patterns, we check that they vary considerably, mainly moving between 3 and 7 meters

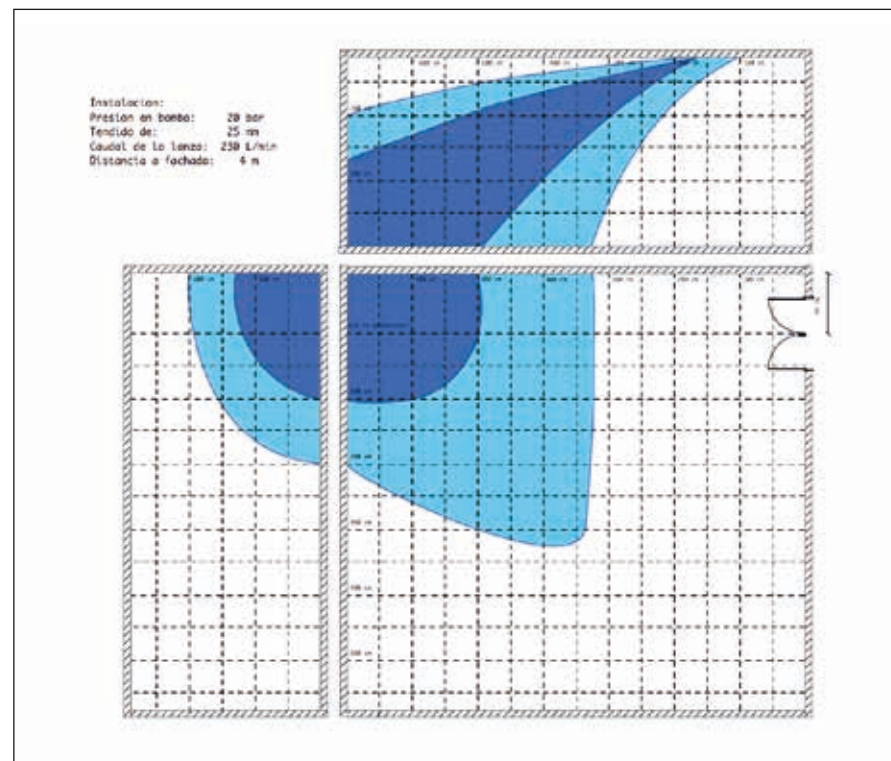
in front of the window, extending in the transverse axis with configurations with lower pressure and higher actual flow.

▼ An installation with a high water pressure from a position away from the façade can make a large amount of water reaches the opposite wall, and not on the fuel surface.



Image courtesy of Pablo Boj





### Final conclusions

#### Type of hydraulic system

From the results obtained in the framework of the study it emerges that, among the facilities studied, the most effective and producing less interference in the exhaust is the one of 45 mm against that of 25 mm, by applying the appropriate pressure to the height we have to achieve, and adjusting the flow to the intensity of the fire.

Although the 45 mm hose is a priori more difficult to handle, in practice it does not pose any particular problem because the operator has a basically static position and, by having a high projection angle, he can place the hose so that the reaction is absorbed by the ground.

▼ An installation with moderate water pressure, from a position close to the façade, has a greater reach in the perpendicular axis of projection pattern.

◀ We have developed patterns projection of different configurations (hose diameter, pressure, distance to facade) from the observation of the water sheet.

#### Operator position

In a real situation, it is difficult for the operator to know the size and distribution of the room into which he or she projects the water beyond what he or she might guess basing on the use of the building. However, we can say that it will always be preferable to start in a position as close to the front as possible and starting the projection of water by focusing a point near the window, because in this way we will reduce the air flow that interrupts the gas output. Furthermore, by using an angle closer to the vertical water projection has a greater radius of dispersion and prevents the water from reaching the opposite wall if this was nearby.

The operator should also be placed in a position allowing him/her to avoid walls, insofar as possible, if these are visible. In any case, it is always useful to the operator to know the dispersion pattern of the jet used, because a more effective implementation can be achieved.

In summary, we can establish the following general rules for the application of this technique in order to improve its effectiveness:

- Use preferably hydraulic systems that allow us an adequate projection of flows based on their diameter and not on their pressure. In the case of Department using small diameter lines, 45 mm hoses instead of 25 mm ones, adjusting the pressure to the height of the fire and the nozzle flow to its intensity.
- The operator must be located as close to the façade as security conditions allow, directing the water jet against the ceiling immediately below the window frame.
- Project the water to a fix point, moving the operator between one touch and the other in order the water projection to reach different areas into the room, avoiding walls if possible.

➡ For more information, go to [www.fundamentosparabomberos.es/](http://www.fundamentosparabomberos.es/)

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# A made in Canada solution for specialist off-road fire fighting

First Responders don't have a choice where fires and accidents happen. In off-road environments, teams are challenged by the fact that their traditional fleet vehicles are too large to get to the scene of an incident quickly and efficiently. To solve this dilemma, fire departments and search and rescue teams the world over, from Australia to Austria, Mexico to Malaysia are increasingly turning to different types of all-terrain vehicle platforms that hold stretchers and other equipment for wildland fire fighting, off-road incidents or disasters such as floods or snow and ice storms.



**Matt Chandler**

**C**anadian based Ontario Drive & Gear Ltd. (ODG), is one such manufacturer who has capitalized on this demand and is fast making a name for itself as the Fire & Rescue industry's supplier of choice. For nearly 50 years, ODG has been the leading manufacturer of extreme terrain vehicles, with the amphibious ARGO world renowned for its versatility and capability of traversing difficult terrain.

▼ The fully amphibious ARGO offers excellent stability and can transport Fire & Rescue personnel and equipment across water to extricate and evacuate injured parties and get them home safely, all without vehicle preparation.

Originally geared towards recreational users, over the years increasing numbers of fire departments and search & rescue organizations have begun to recognize the ARGO's unique capabilities, with many ultimately purchasing vehicles and outfitting them with aftermarket accessories such as stretchers, water tanks and lighting systems to meet departmental and constituency needs.

With demand coming from all corners of the globe for an off-road vehicle designed to address specific industry applications, the company recently unveiled a dedicated line of First Responder ARGOs that let Fire & Rescue personnel go anywhere and 'Get in' and 'Get Out' safely, no matter the terrain. Designed for reliable



Matt Chandler is the Marketing Communications Manager for ARGO and is responsible for spearheading the company's First Responder target market strategy.



Images courtesy of ARGO

off-road fire and rescue, the ARGO Responder MD and FF vehicles feature interchangeable modules allowing the unit to serve as a fire-fighting pump, off-road ambulance or crew transport for a team of up to 6 first-responders.

The ARGO Responder FF features a 75 gallon water tank and 5 gallon drop-in foam cell which firefighters can use to suppress fires on the spot or prevent fires before they start while the ARGO Responder MD features a Ferno #9 stretcher for extricating patients or performing rescues.

First-response features and designs for the fire & rescue vehicle have been in development, and in service around the world for the past ten years but the recent rollout is the first time that ARGO has developed specific models to meet the industry's demands.

Hazmat calls. Train derailments. Wildfires. Wilderness rescues. Disaster response. The applications for off-road, all-terrain first responder vehicles are many and varied, with ARGOs leading the way.

In Norway for instance, the government relies on them for tunnel emergencies. The country is crisscrossed by upwards of 700 railway tunnels, all of which make for

extremely difficult work environments for firefighters. For Norway's first responders, the ARGO has proven itself as the ONLY small vehicle which can work with rail wheels for train or subway tunnel rescues, and with the high load capacity and terrain capabilities to boot.

In Japan meanwhile, the government uses the vehicles to navigate through sensitive terrain in the immediate aftermath of natural disasters. When a series of landslides crippled Hiroshima in August 2014, ARGOs were called on to transport

▲ ARGOs are used by first responders around the world, as this civil defense organization demonstrates in Singapore.

first responders and equipment to and from the area and extricate survivors. With its minimal ground pressure, the impact of an ARGO is actually lighter than an adult's footstep, a feature that was absolutely critical in navigating the sensitive landslide zone. The terrain of the accident was a mixture of sediment,

► Swamps, water, forests, mountains – the ARGO thrives in the off-road environments that traditional vehicles are unable to tackle.







Images courtesy of ARGO



▲ For Norway's first responders, the ARGO has proven itself as the **ONLY** small vehicle which can work with rail wheels for train or subway tunnel rescues, and with the high load capacity and terrain capabilities to boot.

◀ With their minimal ground pressure, the impact of the ARGO vehicle is actually lighter than an adult's footstep, a feature that is absolutely critical in navigating disaster recovery zones, as this Japanese fire department demonstrates.

debris and rubble, which the ARGO had no trouble in managing.

Aside from its ability to tread lightly and its versatility in off-road situations, the vehicle's amphibious capabilities are what has won it praise from departments whose territories include any sort of water bodies, places where accidents and incidents are all too prevalent.

The Township of Muskoka Lakes in Ontario's 'Cottage Country' is a good example of the type of environment where the ARGO thrives. Littered with lakes, the town's fire department have come to rely on their ARGO for a multitude of amphibious water rescues including kayaking mishaps and snowmobilers falling through early spring ice among others.

"We did research into getting a vehicle that can be used all year round." Chief Harry Baranik comments. "The ARGO was the only vehicle that could float and go over very rough terrain. When you have members of the fire department going out to rescue people in ice water situations, this is the perfect vehicle to do it."

Snow storms are another area in which ARGOS have proven their mettle. In areas prone to torrential storms, firefighters are relied upon to assist stranded people, quite often a tremendous challenge when the snow comes down so fast that snowmobiles, salt trucks and heavy equipment are unable to offer respite. The 'Snowvember' storm that rocked Buffalo in 2014 showed just how important a

specialist all terrain / off road vehicle can be in a crisis situation. From November 17-21, 2014, a lake effect snowstorm of epic proportions pummeled areas of western New York. More than 7 feet of snow fell in a narrow band extending from Lake Erie through South Buffalo and into its suburbs. People were trapped in their homes as snow piled against doors more quickly than it could be removed. A state of emergency was declared and except for EMS personnel, everyone was ordered to stay off the streets. Thankfully, one of the local departments had a fully tracked ARGO that ended up being used around the clock to rescue trapped residents and help get first responders to where they needed to be. As the local chief remarked after the worst of the recovery period was over, 'When every second counts, you can count on the ARGO.'

Affirming the above remarks, one of the earliest advocates of the ARGO as a first response vehicle was Kirk Walker, the Executive Director of REACT, a volunteer search & rescue unit that serves the region around Waterloo, Ontario.

Kirk has been using the ARGO for nearly ten years notes, "The greatest value of the ARGO could be in the improved response times it allows EMS teams. The ARGO's all-terrain ability simply allows the rescue or recovery scene faster. Rough terrain is a serious obstacle to paramedics on foot. It's difficult to carry a stretcher safely over broken ground: it can become dangerous for the patient and hazardous to the paramedics who carry the stretcher. If your rescue is two or three kilometers into the bush, the ARGO gets life-saving personnel and equipment onto the scene quickly, and back out again safely."

As ODG works with more and more fire departments and search and rescue organizations, it continues to tweak the ARGO to ensure first responders can take on trouble like never before and get home safe. With 75 per cent of the planet covered in water and a high proportion of terrain accessible to traditional trucks, there's no shortage of places where these versatile off-road machines can thrive. No doubt it's only a matter of time before readers see one in their own neighbourhood.

➔ For more information, go to [www.ARGOxtv.com](http://www.ARGOxtv.com)

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# Unmanned Aerial Systems (sUAS) or drone training

As technology improves and changes, so does the way we conduct fire-rescue operations. One of the biggest changes to the fire service in recent years has been the introduction of small Unmanned Aerial Systems (sUAS) or drones into daily operations. With the inclusion of this new tool, not only do we change the way incidents are managed, but also the way we train for them. When properly used, drones can dramatically increase safety. But, just like every tool we use, comprehensive and ongoing training is the key to success.



**Jason Hershcopf**

Jason Hershcopf is the President of Cobb UAS, a company dedicated to the training and safe and effective use of drones. He has been involved with fire rescue for 26 years and is currently a paramedic in the US. In addition, he has been flying remote control aircraft for over 30 years.

**T**he uses for drones are unlimited and can be applied in a variety of ways: 360 degree checks at house fires, scouting the upper floors of a high-rise building, hazardous materials investigation, pre-planning, technical rescue, as well as search and rescue, just to name a few. There is no denying that drones will play a more and more important role for first responders including firefighters as the technology develops. Drones provide a higher level of safety for firefighters and access to new information.

▼ Using thermal imaging, firefighters can see exactly where the fire is located in this RV fire.



Image courtesy of Garrett Bryl

Drones also provide unique real-time tactical and strategic information on the fireground; information which was not previously available through other means. For instance, thermal imaging has been available for years and many departments use handheld cameras. However, thermal imaging cameras can now be mounted to drones, allowing pilots to fly above structures to get a more complete picture of a scene. Incident commanders (ICs) can then decide how to extinguish a fire or contain a hazard with the least risk to firefighters.

Drones can also be used to rapidly inspect entire structures without having to worry about size, hazards or access issues, or to quickly cover large areas during search and rescue operations.

► This DJI Inspire is being used to provide real-time imagery to incident commanders during recent floods in Texas.

Additionally, we can utilize drones with mounted sensors for HAZMAT incidents. Drones can fly into potentially contaminated areas to obtain readings without risk to fire/rescue personnel, which is not only safer, but also cheaper, as disposing of a drone typically is less costly than HAZMAT suits and decontamination equipment.

For large scale or geographically dispersed incidents, drones can provide a better vantage point. For example, an IC can get a better view of a brush fire to learn where to deploy resources and what direction the fire is moving. Drones can fly above trees and get much closer to an actual event than the operator or command post. As a result, the aerial view will allow the survey of acres, versus the limited amount that can be seen on the ground.

Furthermore drones can capture videos and still images of an incident or training, in addition to streaming live HD videos. These images can then be used as part of a debriefing or as evidence in an investigation.

When we look at resources that are currently available, many departments have helicopters either as part of their agency's equipment or as part of an agreement with another agency. In either case, the use of helicopters can be appropriate for covering large areas or extended flight times, but is costly. At hundreds or thousands of dollars per flight hour, they are significantly more expensive to operate than drones. Helicopters can also take an extended period of time to request and arrive on scene, while drones just need to be pulled out of their case and launched, usually within minutes. Drones also provide the ability to immediately respond to instructions, while using a helicopter requires radio transmissions and the pilots/operators understanding of what is being asked. In addition, high definition videos can be hooked up from drones and directly be linked to a command post or vehicle.

Given the unique and dynamic operating environment, a two person pilot/operator team is usually

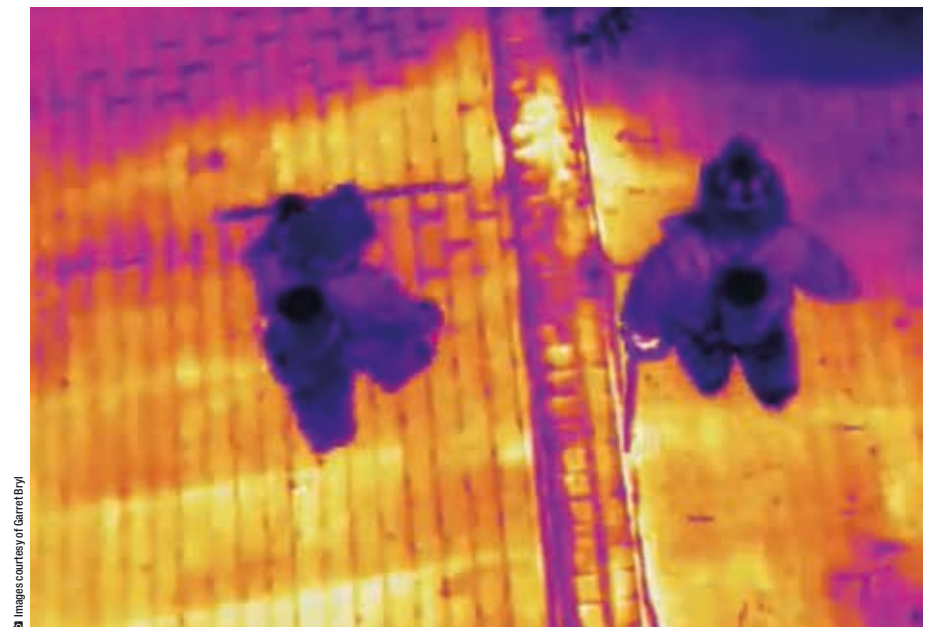


recommended. This allows the pilot to concentrate on the safe operation of the aircraft, and the observer the operation of the cameras/payload. Using this methodology is similar to the crew resource management (CRM) successfully used in the airline industry to improve safety by distributing workload.

Having said that, operating a drone during an emergency is very different from flying a drone as a hobby, or from flying commercial drones to take pictures or videos, and it's most likely also different from flying drones during training. The dynamic and often unknown environment of an incident

presents unique challenges. As such, a live incident is not an appropriate time for a new pilot to fly a drone for the first time. Including drones in daily training is imperative. These training evolutions not only help pilots become familiar with how the aircraft operates, but help camera operators learn how to get the best vantage point. They also teach the IC's what new information is available, so they can think about how best to use it. Having drones flying around during

▼ Thermal imaging provides valuable insight as to the stability of a roof. This image shows firefighters walking across a roof that is compromised.



Images courtesy of Garrett Bryl





▲ This image from droneSim Pro shows how a drone can be used to provide live imagery to incident commanders during a house fire.

training also allows firefighters learn to operate with the additional overhead sounds and distractions.

However, before a pilot is able to fly a drone during operations, he or she needs a lot of practice and comprehensive training. A great way to start is to practice flying a drone on a simulator such as droneSim Pro ([www.dronesimpro.com](http://www.dronesimpro.com)), which was originally developed to meet the needs of the fire service. The simulator allows drone pilots to learn basic, as well as advanced skills and help develop reflexes that are important in order to prevent costly aircraft accidents and damage. Another advantage of the simulator is that pilots can practice 24/7, without having to worry about weather conditions or battery life. Once basic flight skills are mastered, pilots can transition to the real aircraft.

As a next step, pilots need to learn about fly around hazards, unknown areas, thermals, smoke and water. Most of the time, pilots are going to start flying in environments that they have not previously had a chance to surveil prior

to an incident, similar to medevac pilots. Besides, if they are going to fly beyond visual line of sight (BVLOS), they will not be able to see the drone and will only be able to control it and avoid obstacles by using an onboard camera.

For Departments that want to use drones to carry a payload like a radio, life jacket, or other supplies, pilots must be proficient in flying a drone with the additional weight to deliver the payload accurately to its destination. The increased weight decreases the maneuverability of the drone and failure of the lift system can cause injury to people on the ground.

Firefighters also need to learn the capabilities of the different types of drones, and which one will best complete a mission. For example, to cover a large area for search and rescue, a fixed-wing aircraft might be the best option. A quadcopter, or bigger, would be best to cover a small area or maintaining a visual on a specific area of interest. There is also a new generation of drones available called tilt-rotors. These aircrafts allow a pilot to take off like a quadcopter, but then provide the range and speed of a fixed wing. Given the different options, knowing the best tool to use is going to give better results.

In addition, pilot training also needs to include local regulations and department policies. For instance, some areas don't allow drones to be flown over people who are not actively involved with a flight, or who haven't been notified prior to drone operations.

Moreover, incident commanders need to learn how to integrate the new information they are receiving as a part of their command and control. For example, a thermal imaging camera can be flown over a roof and give information on whether or not it is safe to allow firefighters to walk on it. They can also make command decisions on how to attack a fire based on thermal flows. As we learn to interpret this new information, we can determine where, or even if there is a fire, how it is affecting a structure or environment, and how we can keep firefighters safe.

Admittedly, there are a few things that need to be considered and learned when implementing drones into daily operations. However, they are an amazing asset and can help prevent accidents. And most importantly they can potentially save lives!

➔ For more information, go to [www.cobbuas.com](http://www.cobbuas.com)

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## **FDIC International Lounge**

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# 1st UK Rosenbauer AT for Land's End Airport



Land's End Airport (EGHC) in the county of Cornwall, UK is the most south westerly commercial airport operation on the UK mainland. This successful – privately owned airport is located in a stunning coastal location boasting unrestricted views looking out on to one of the busiest shipping lanes in the North Atlantic Ocean. The airport offers an exclusive scheduled air link to St Mary's Airport on the archipelago Isles of Scilly which consists of five inhabited islands located 28 miles west of the Cornish peninsula.

**L**and's End Airport officially opened in June 1937 with the inaugural flight to the Isles of Scilly taking place on the 15th September 1937 when a de Havilland Dragon with the pilot and four passengers landed on St Marys golf course on the largest of the Scilly Isles. Since 2012 Land's End Airport has been locally owned by the Isles of Scilly Steamship Group (ISSG) who retain their administrative headquarters in Penzance.

ISSG's subsidiary Lands End Airport Limited operate the airport and another subsidiary Isles of Scilly Skybus is the sole provider of aircraft on this exclusive route to St Mary's Airport! In 2013 the company embarked on a multi million pound (£) investment in the airport to upgrade many of its dated and inadequate facilities. With some additional funding courtesy of the European Regional Development Fund the airport has seen the completion of some significant capital

projects in the past 36 months which have greatly enhanced the airports infrastructure and the overall passenger experience! These include the construction of a new eco-friendly passenger terminal, a state-of-the-art air traffic control tower, the installation of new lighting & navigation

▼ **The stunning M.A.N 13.290 4x4/ Rosenbauer Advanced Technology 3 ARFF vehicle posed in the Cornish sun.**



Image courtesy of Gary Parkinson

systems, improvements to the apron plus the laying of two of their four runways to an all weather surface. The final instalment will see the installation of a Global Navigation Satellite System (GNSS) to the main runways.

The airport fire & rescue service have also seen some specific enhancements under the directive of the Isles of Scilly Steamship Group. In 2013 the airport was upgraded from category 2 to category 3 aircraft movements and additional fire service personnel were recruited to fully comply with UK CAA CAT 3 requirements. All fire-service personnel now receive professional training at a UK CAA certified fire-training centre and more recently the fire station was extensively refurbished & modernised. In the summer of 2015 the airport management engaged in discussions with leading European fire engine manufacturers for the supply of their first new & purpose built ARFF vehicle!

Following a competitive tendering process; an order was placed with Rosenbauer UK for the supply of a state-of-the-art Rosenbauer Advanced Technology 3 series aviation, rescue & fire-fighting vehicle; the first of its kind in the United Kingdom.

The 3rd generation of the Rosenbauer Advanced Technology series (AT for short) captivates over 90 safety and ergonomic innovations gained from the production of over 5000 AT series fire-fighting vehicles since its introduction in 1994! The AT series boasts a production process which is continuously being perfected. The superstructure makes use of bent laser-cut aluminium sheets assembled into a high-strength light-weight body which is self-supporting, torsion-resistant and finished with robust flush-fitting plastic covers. The seamless integrated crew cabin has been refined with the latest safety and ergonomic features and includes the innovative safe exit rotating crew-cab stairs – permitting the crew to safely exit the vehicle even when fully donned in PPE. The spacious interior offers various seating layouts with 3 x SCBA mountings, 3-point safety belts to all seats plus an optional complete roll-over airbag system with seatbelt pre-tensioners.

The innovative rear superstructure can accommodate both water, foam and dry chemical fire-fighting media; the pump and a comprehensive array of fire-fighting and crash-rescue apparatus stowed on space saving, flexible and easy accessible rotating shelves – which are fully illuminated

with the latest LED lighting technology. The Rosenbauer Logic-Control System based on CAN-bus technology provides the driver with a quick and comprehensive overview of the operational status of the entire vehicle. It provides information about the tank contents, open equipment lockers and much more. In addition, all signals units, lighting systems and fire-fighting media can be controlled & monitored from this unit. In the rear locker there is an additional LCD flat screen which virtually mirrors all of the control & monitoring options on the in-cab mounted system.

The Rosenbauer Advanced Technology series is available on a wide range of chassis & engine combinations with custom built superstructures and flexible fire-fighting media in a superior fire-engine package adaptable for urban, industrial and aviation rescue & fire-fighting applications. Factually the AT series is one of the most successful fire engine concepts of the 21st century!

Working closely with the customer Rosenbauer UK have recently fulfilled the delivery of this stunning AT3 aerodrome rescue and fire fighting vehicle tailored to meet the urban dynamics of Land's End Airport Fire & Rescue Service. This UK 1st (Rosenbauer AT No 4994) is set-up on the robust M.A.N TGM 13.290 4x4 chassis incorporating the latest 290 bhp Euro 6 diesel engine and 12 speed Tipmatic automated transmission. This AT3 makes use of a seamless clean flowing Rosenbauer crew safety cabin with 3 x forward facing crew seats fitted with integrated SCBA mountings and seat belt pre tensioners plus wide opening doors linked to the innovative safe exit crew cab steps.

Land's End Airport specified their AT3 with a rear superstructure incorporating the inventive Rosenbauer easy access stowage system enclosed by 7 x full length roller shutter doors finished in a stunning dark grey paint finish. Fire-fighting media includes 2,445 litres of water, 326 litres of foam plus a very cleverly stowed 75 kg Perren Engineering DCP trolley. Due to a low-height restriction the tender makes use of a remote bumper mounted Rosenbauer RM15 monitor delivering 1,800 lpm fed by a Rosenbauer NH35 multi pressure pump rated at 2,500 lpm @ 10 bar linked to the Rosenbauer FIXMIX foam proportioning system. The tender incorporates a 80 metre high-pressure hose reel fitted with a Rosenbauer Select Flow RB100 branch – plus a vehicle under body self-protection



Image courtesy of Gary Parkinson

▲ **The 75kg DCP trolley lowered by an innovative compact electric winch system.**

system. This stunning category 3 ARFF vehicle which is finished to a class leading standard meets all current UK CAA, ICAO and NFPA standards.

Rosenbauer UK Managing Director, Oliver North, commented; "The AT, which we've had the pleasure to build for Land's End Airport, is an extremely poignant one as it completely raises the bar for what any commercial chassis airfield fire fighting appliance can be. Not only airport specific, it highlights our ability to use the market leading AT and make it bespoke for any fire fighting organisation.

With the first AT domestic fire engines recently delivered to the Buckinghamshire Fire & Rescue Service, I genuinely feel that this initial batch of AT's will be the first of hundreds due into the UK over the next few years. Our initial feedback from the fire-fighters who will be using these appliances over the next twenty years or so has been extremely flattering; and we look forward to an excellent partnership supporting their AT's over the next few decades."

For more information, go to [www.rosenbauer.co.uk](http://www.rosenbauer.co.uk)



21-22 September 2016, NEC, Birmingham, UK

# The Emergency Services Show

## See the latest development in drones and hybrid vehicles

**T**he latest developments in drones, hybrid vehicles and PPE will all be showcased at this year's Emergency Services Show which takes place in Hall 5 at the NEC, Birmingham, UK from 21-22 September 2016. Fire and rescue personnel and industrial brigades from around the world are invited to attend the free event to familiarise themselves with the very latest vehicles and equipment designed to help them fight fires and respond to terrorist attacks, road traffic accidents and natural disasters.

### New: Drone Zone

Launched in partnership with SUAS Global, the new Drone Zone will showcase drone suppliers and bring together industry specialists with end-users. The free seminar programme includes presentations on risk management,

privacy, security implications and regulations. Drone supplier Coptez will be on hand to offer advice on how to choose the right drone and what kind of training is required. Other UAV suppliers exhibiting include Aeraccess, Excelsior, Primetech and WH Bence. Visitors with an interest in air surveillance should also pay a visit to the UK Civil Air Patrol (CAP) stand where a Cavalon autogyro will be on display.

### Showcase of Latest Kit and Technology

Visitors with an interest in vehicles will find leading names such as Mercedes-Benz Trucks, BMW, Volvo Emergency Services Cars, Volvo Trucks and as well as Incident Command Units and welfare units, all types of in and on-vehicle ancillary equipment, including communications and IT.

On the Excelsior stand, visitors will be able to see the new joint command vehicle for police and fire services in Northamptonshire. Currently under construction, it is believed will be the only one of its kind in the UK and will provide a base for commanders when in attendance at large scale or major incidents.

Terberg Fire and Rescue will be launching TACR4, the latest model in its range of TACR compact aircraft vehicles. The vehicle's multi-role capability allows the units to be used not only in an airport environment but also in the local authority, industrial and military market sectors. The unit can be reconfigured very quickly to suit various incident types for example from wildfire applications in summer seasons to winter flooding.

Winter readiness will be a theme throughout the show with a number of free seminar sessions focusing on flooding, presented by The Environment Agency, National Flood Forum and UK emergency services. Meanwhile the Flood Advisory Service team will exhibit their 40ft, roadshow trailer which is used to visit flood

prone and flood hit communities providing advice on flood risk and protection.

Barrus, a leading custom-engine builder, will be showcasing the Mercury 175hp diesel outboard and the 185hp kerosene version. The diesel engine is ideal for applications where petrol is either not available or carries a fire risk.

Delta Fire will stage the official launch of its new Generation 2 Pro Series Fire Nozzles at the Emergency Services Show. It will also launch the new Delta 'Attack' and 'Lay' Packs and the new patented Nozzle Hose. Meanwhile Le Maitre will be demonstrating its new RESCUE 300 high powered smoke generator and Holmatro will display its new 5000 series cutters, which are lighter and more ergonomic than ever, significantly reducing the physical burden on the operator.

Barquins is exhibiting its bariatric training mannequins for the first time anywhere at this year's show and Harken Industrial's Technical Team will be demonstrating the operational features of the PowerSeat man riding winch. Other major names confirmed in the impressive indoor and outdoor exhibition include Bristol Uniforms, PBI Performance Products, Draeger, Holmatro, Weber Rescue, Emergency One/Clan Tools & Plant, Ferno, Openhouse Products, Physio-Control, Scott Safety and Interspiro.

The latest kit and technology will also be widely discussed in the PPE and ICT Innovation Theatres, details of which will be published soon.

### Registration

Entry to the exhibition and seminars is free. The NEC is linked to Birmingham International Station and Birmingham Airport and directly accessible from the UK motorway network. Parking for visitors and exhibitors is free of charge.

 For more information, go to [www.emergencyuk.com](http://www.emergencyuk.com)

## EXHIBITOR SHOWCASE

### Armadillo Merino

 Stand D78

Armadillo Merino design kick ass socks to protect your feet in the heat of action however their latest innovation is even more cerebral. Recent focus has been on heads over heels to incorporate new yarns and garment features that will significantly increase



head protection and user performance.

The new Fire Resistant Balaclava, is a very unique garment; it's a world first, as it combines a special superfine fire resistant merino yarn with the latest in seamless technology in a balaclava that delivers superior safety and comfort to users. The new balaclava also draws on recent innovations in Formula One and the Special Forces community to create a remarkable balaclava that helps optimise wearer performance in

high-risk environments. Better performance is achieved by being more comfortable with super soft next-to-skin comfort, no abrasive seams, less heat, less sweat and no smell. Armadillo Merino also offers a "tailor-made" program allowing the customised design of headwear to meet your specific PPE and helmet requirements. The fire resistant Balaclava can also be colour matched to integrate with your existing PPE.

 [www.armadillomerino.com](http://www.armadillomerino.com)



### Bristol Uniforms

 Stand A70

Bristol Uniforms is a leading designer, manufacturer and supplier of protective clothing, meeting the diverse needs of emergency services personnel



in the UK and around the world.

Working with leading international fibre and fabric manufacturers including WL Gore, PBI Performance Products and DuPont, Bristol's in-house design teams continue to develop innovative and progressive garments offering maximum safety, flexibility and comfort.

This year, Bristol will be exhibiting its broad range of PPE solutions designed to meet specific needs, such as Air Ambulance coveralls, Ambulance apparel for

Hazardous Area Response Teams (HART), a range of high visibility and wet weather clothing, and its specialist Urban Search and Rescue (USAR) range.

Also on display will be Bristol's innovative LayerFlex range, which provides a layered approach to PPE for firefighters. LayerFlex comprises three garments: RescueFlex Coat, XFlex Outer Coat and XFlex Trousers, each with a variety of fabric options drawing on specialist materials from WL Gore, PBI

Performance Products and DuPont. When used in different combinations, these garments provide appropriate protection for structural and wildland firefighting as well as technical rescue operations.

In addition to designing and manufacturing world-class PPE, Bristol also offers a lifetime approach to garment maintenance, cleaning and repairing stock through its in-house managed services offering.

 [www.bristoluniforms.com](http://www.bristoluniforms.com)

### Goliath Footwear

 Stand G78

If you are attending the Emergency Services Show 2016 this year, make sure you see the latest range from Goliath on stand G78

On display will be full structural fire boots, wildland boots, and a variety of multi-role

boots handing fire and rescue teams much greater adaptability. In particular ask about the 'Pyros' GORE-TEX® rescue boot and the new Apollo Wildland boot using TenCate® technical fabric. The Goliath's quick release water rescue boot will also be available

for a fully protective footwear solution for flood rescue. All YDS fire boots feature the original injected DDR technology produced by the ISO9001 quality assured factory, which delivers a tough rubber outer sole to protect from nicks and cuts and

300°C heat, and an air injected rubber mid-layer provides a cushioned comfort for the foot. The 'Rubber / Rubber' sole material combination provides the optimum protection in hazardous and hot environments. In-house SATRA testing ensure all YDS fire boots meet the high standards of fire crews around the world, with their range independently tested to meet the current European and Australian firefighter safety boot regulations.

 [www.goliath.co.uk](http://www.goliath.co.uk)





## Hainsworth Technology

**Stand B86**

Hainsworth Technology are passionate about protecting the individuals who face hazardous situations as part of their profession and commit to ensuring that the kit firefighters wear meets the very highest

level of performance, giving them the confidence they will return home safely at the end of every shift.

Hainsworth are lucky to be able to utilise more than 150 years' experience and

knowledge as a manufacturer of industry-leading fabrics for firefighter PPE and firmly believe in the three core messages they apply to the development of all Hainsworth Technology products – Design that Saves, Protection that Shows and Quality that Lasts. This, combined with an intimate knowledge of the properties of different fibres and yarns, led to the development of a range of both outer shell and lining products which maximise comfort, thermal performance, and durability.

The TITAN range of outer shell fabrics help minimise the effects of heat stress as they are breathable, lightweight and flexible allowing the wearer better manoeuvrability and regulation of temperature. ECO-DRY presents a range of solutions for outer shell, linings and now also station wear.

Hainsworth Technology will showcase their full range of protective fabrics from stand B86.

[www.protectyou.co.uk](http://www.protectyou.co.uk)



**HAINSWORTH**  
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## Island Remote Imaging Solutions

**Stand OS110**

Island Remote Imaging Solutions (IRIS) has evolved from the emergency rescue sector through its sister company Emergency Fire & Safety Ltd.

Due to the high demand of innovative rescue products and services in the rescue world we set out to create a platform for product development and innovations in the following areas;

- UAVs and Drones in the emergency world,
- Water rescue products

- Slurry rescue
- Safety audits
- Thermal imaging
- 3D Imaging and mapping
- Medical innovation of rescue products
- Drone platforms for all levels of rescue
- Drone Racing
- Water rescue drones that can work in water environments

IRIS has invested in the best quality aerial platform (15 working aerial platforms camera gimbal system).

They are unique in the area of thermal imaging and are one of the only operator's in this field with thermal imaging ground and aerial work, to assess the energy efficiency of commercial or domestic premises.

IRIS team members are also part of the SKYWATCH, which is a charitable organisation which works with all the emergency services in the areas of Aerial search & rescue, missing persons, investigations and so on. They are also innovators

in the world of rescue and are currently releasing a specialist rescue system that can be deployed by drones which will be on display during the show.

[james@irisni.co.uk](mailto:james@irisni.co.uk)



## Jolly Scarpe SpA

**Stand F68**

Jolly Scarpe SpA has been working in the world of professional footwear for over 30 years in support of those who dedicate their lives to the safeguarding of their community's citizens.

As well as dominating the UK fire-fighting market for many years with their wide range of innovative and long wearing fire boots, Jolly is successfully exporting fire boots to more than 30 countries worldwide. Along with these, their best known products, Jolly also manufactures high quality boots for various specialist tasks within Military, Police, Search & Rescue and Law Enforcement environments offering the highest possible foot protection in the most

hazardous conditions whilst still able to offer the utmost in comfort.

Extensive research, advanced manufacturing techniques, innovative materials, safety, comfort and excellent customer service are the fundamental values which make Jolly Scarpe a world leader and true reference point for professionals working in these sectors.

[www.jollyscarpe.com](http://www.jollyscarpe.com)



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21 - 22 September, Birmingham NEC ■ **STAND H36**

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## PBI Performance Products

Stand A64

PBI fabrics are the first line of defence on the fire ground. They are renowned for their exceptional flame resistance and thermal protection from radiant heat and favoured by firefighters around the world. PBI offers a wide range of fabrics that meet the needs

of every situation and work effectively as an integral part of the protective garment. Each fabric has different properties and applications, but every PBI fabric provides the required protection from heat and flame that an outer fabric must deliver.

All PBI outer fabrics including PBI Gold, PBI Matrix, PBI Max, Gemini XTL, Titan 1260 and Ikena X55 are lightweight and strong and achieve high flame resistance. They deliver excellent tensile strength and will not become brittle, shrink or break open

when exposed to flame and high temperatures. This means that the integrity of the internal layers of the garment is protected and the transfer of any radiant heat is slower, allowing more time for firefighters to escape to safety in a situation such as a flashover.

PBI's 'next to skin' fabrics include PBI TriGuard, which delivers excellent protection against heat, flash fire and arc flash.

[www.pbipproducts.com](http://www.pbipproducts.com)

**PBI PERFORMANCE PRODUCTS, INC.**

## Reach and Rescue Ltd

Stand OS110

The award winning, innovative Reach and Rescue pole has successfully saved many lives around the world. The revolutionary system has been designed by Reach and Rescue Ltd, a UK based company, in conjunction with a leading UK Fire and Rescue Service, to speed up rescues massively and keep the operator safe from the hazard zone in situations that can involve water, ice, mud and flood related incidents.

The key function of the Reach and Rescue Pole is

that it accurately deploys a flotation or rescue device to a casualty as quickly as possible, thus saving valuable time on the rescue that might otherwise have been wasted, leading to possible tragedy. This directional method of administering aid is significantly a more accurate form of

rescuing than the existing throw bag procedure.

From an operational perspective, the Reach and Rescue Pole is incredibly versatile. There is a huge selection of flotation and retrieval attachments that are available in kits or individually meaning the Pole can be

specifically tailored to suit the requirements of any rescue situation. This year we will be launching a brand new product at the ESS, which ticks a huge box for manual handling in the Water Rescue Services so be sure to visit us on Stand OS110.

[www.reachandrescue.com](http://www.reachandrescue.com)

**Reach and Rescue**  
Long Reach Telescopic Rescue System

## Vimpex

Stand C73

Vimpex will be unveiling a variety of new industry products to add to its current range of emergency service equipment, including the latest in thermal imaging, helmets, fire and rescue gloves, nozzles and USAR kit. Vimpex partner with leading international

manufactures to ensure its UK and European customers are provided with the most up-to-date products available.

As a specialist supplier of personal protective equipment (PPE), thermal imaging cameras, firefighting and technical rescue products, working closely with

its specialist manufacturers, Vimpex safeguard UK emergency service personnel by only offering quality products designed to exceed user expectations. The team at Vimpex work hard to supply the products their customers want at the right price, while offering

a sales and after-sales service that is second to none.

At ESS this year, Vimpex will host guest manufacturing partners from Pacific Helmets, Athena Gloves, Adaro Torches and Makita. These representatives will be available on Stand C73 to discuss current and future product developments and answer any question you might have. Come and see our new look stand and catch up on the latest product offering from Vimpex.

[www.vimpex.co.uk](http://www.vimpex.co.uk)

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# Can lightweight PPE be truly safe?

The international PPE industry is changing, with lightweight garments increasingly coming to the fore. But, is it possible that textile innovations can improve physiological conditions for fire fighters, whilst still ensuring adequate protection? What advances are taking place in the world of fabrics, to improve safety and comfort? And are there any stand-out examples of brigades leading the way? Rob Beadle, PPE specialist at technical textiles at Arville, discusses...



**Rob Beadle**

**T**he PPE market is constantly evolving. Sometimes innovations may appear, at first glance, seemingly minor. Replacing heat-absorbent hi-vis trims, for example, with fabric that can dissipate stored energy, and reduce the risk of burns without compromising the material's reflective properties, may only seem like a small adjustment. However, the process still requires years of research, development, testing and approval, and it is most definitely worth the effort. The resulting wellbeing and safety benefits, to the fire fighter, can be significant.

Other PPE developments are even

more revolutionary. In such instances, the process can therefore take longer still, and the level of debate, on an international scale, is likely to be vast. But progress is not only important – it is imperative.

Take lightweight PPE, for example. There is a growing need to balance protection with physiology, which is admittedly no mean feat in heat-intensive situations. Of course the fire fighter needs to be safeguarded with robust,

▼ PPE must fulfil different levels of safety e.g. thermal and chemical protection, fire retardance and water resistance.



Rob Beadle is PPE Specialist at Arville.



fire retardant PPE, but the dangers of 'over protection' must also be acknowledged. If moisture management is not specified in the PPE's design, heat induced heart attacks or severe scalding from sweating, could pose risks to life equally as dangerous as the fires themselves.

The development of lightweight, flexible and breathable PPE is therefore not just driven by comfort-centric considerations. It could actually be considered a safety-critical situation.

Thankfully, due to textile innovations and the availability of high-performance yarns and treatments, it is possible to manufacture technically proficient PPE with different levels of thermal and chemical protection, fire retardance and water resistance. The durability of these textiles also ensures value for money, which is crucial in the cost-sensitive fire fighting sector.

Further modernisations mean woven textile-based PPE products can be designed, which are lightweight, flexible and breathable. The result is garments that are more wearable and that aid agility – particularly important when considering that only 5% of a fire fighter's working life is spent in a fireground scenario. Flexibility,

comfort and focus are especially important when speaking to a distressed individual in a trapped car, for instance.

However, such technological advances will also ensure the fire fighter is physiologically more comfortable during a heat-intensive emergency, due to the improved level of internal moisture management.

Layered PPE with carefully engineered fibre placement is driving much of the progress, and is a strategy being trialled in the UK, for example, by Greater Manchester Fire & Rescue Service.

Studies have shown that an inner garment made from absorbent fibres can help wick away and dissipate sweat. It facilitates moisture movement to keep the individual dry, without adding to the weight of the apparel.

Then there's the PPE's lining to consider. Quilted linings made from non-woven fibres may be breathable, but are bulky and not particularly ergonomic. That's why they're being replaced by more flexible PTFE membranes to aid water vapour transfer, moving moisture away from the individual and out of the garment.

The final requirement for the layered system is a durable, yet lightweight and

▲ The PPE market has come a long way over the years – it is startling to think back to when fire fighters worked in heavy woollen tunics and rubber pants.

breathable outer shell fabric that can form a barrier to heat and flames.

This layered system means the fire fighter can wear the level of protection required for the situation at hand, thus reducing the surplus weight carried when full PPE is not necessary.

It could even be argued that fire fighters' underwear should form part of the PPE range, to ensure a truly layered approach and protection from the skin out. Otherwise, nylon undergarments could still pose a burn risk. This is something textiles specialists can tackle with ease, if brigades will allocate the budget. Unfortunately however, cost-driven decision making, whilst understandable, sometimes holds innovation back.

Of course any PPE developments need to be compliant with international safety standards such as EN469 and/or AS/NZS4967, and laboratory testing will assess the performance of lightweight fabrics under varied trial conditions.





Image courtesy of Rob Beadle

◀ Modern fire fighter PPE must strike the right balance between protection and comfort.

world of fire fighting. The sheer level of diversity adds weight to the argument that industry standards can only outline the minimum quality benchmark. The demands placed on one fire fighter can vary significantly to the next. In the UK alone, for instance, it is naïve to think that a fire fighter in London should wear the same PPE as a fire fighter in Oxfordshire. The risks in the capital city are incredibly different to those in quieter residential suburbs where there are no metros or airports. The PPE requirements for that fire fighter are therefore very different too.

Look further afield and fire fighting conditions become even more varied. Wildfires, common in Australia for example, are often trickier to tackle than structural fires because of the added complexity of wind. This will further influence the requirements that the PPE must fulfil. It also perhaps goes some way to explaining why testing, in that part of the world, is so user-driven, and the market, steered by the Australian Fire Advice Council, is so advanced.

Industry input is also very prevalent in America, with fire fighters being extremely vocal and their viewpoints immediately taken on board. Unfortunately in some parts of Europe, contribution at steering committee level is less prevalent, again largely due to resource constraints.

But collaboration is important, as is talking. That's why Arville has proactively established relationships with brigades and advisors throughout the UK and overseas – to understand exactly what the PPE needs to do, before textile developments even unfold.

The PPE market has come a long way over the years – it is startling to think back to when fire fighters worked in heavy woollen tunics and rubber pants. When changes first started to be implemented, fire fighters unsurprisingly expressed caution at the mention of lightweight materials. Nowadays, on the other hand, users will openly express how important lightweight really is.

➔ For more information, go to [www.arville.com](http://www.arville.com)

But it is important to think above and beyond the standards – they should only be seen as setting the baseline. With engineering innovation and ever-smarter thinking, it is possible to design continually more advanced lightweight fabrics that strike an effective balance between protection and comfort.

David Matthews, a fire and industrial PPE specialist who has travelled the world to drive progress in this niche field, believes that a fire fighter is rarely 'comfortable' in the true sense of the word. However, because these personnel are constantly exposed to extremely heat-intense situations, it is important that textiles specialists – with the input of those in industry – continually innovate to achieve the aforementioned balance. Collectively, and collaboratively, we must ensure fire fighters are safe, but they should not be

overprotected to the point that physiology in fact becomes an added danger.

It must be noted that safety and 'comfort' aren't actually the only factors that need to be considered when it comes to lightweight PPE. Brigades understandably hone in on the likely lifespan of garments too, wary that longevity could be compromised if personnel must de-robe and wash the PPE after every incident. Textiles specialists are therefore working hard to manufacture long-lasting, compliant PPE fabrics that can maintain performance consistency even after repeated cleansing, thus controlling costs and protecting brigades' return on investment.

Is there such thing as a single 'best fit' solution? Whilst it would be convenient to find a 'one size suits all' type of lightweight PPE, this is unlikely to be feasible in the



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# Computational Fluid Dynamics Analysis of a PPV Fan

Performance data of modern PPV fans differ from manufacturer to manufacturer although motor size and impeller diameter is nearly same. This causes uncertainty among firefighters who have to decide about investments in new equipment.



Hans Rußwurm



Professor Philipp Epple

Hans Rußwurm, Rußwurm Ventilatoren GmbH, Germany.

Prof. Dr.-Ing. Philipp Epple, Coburg University of Applied Sciences, Germany.

**H**ow to get comparability? International and common accepted standards are not there: AMCA 240 is preferred by American manufacturers, European manufacturers alternate between industrial standards (DIN 24163, ISO...) and own not validated measurement methods. So how to find an answer, a neutral point of view?

Therefore, in order to have a better understanding of the performance of a PPV fan, first two scenarios were investigated. First, the fan running alone and then, when running in a burning building. These two scenarios were simulated with computational fluid dynamics (CFD) and their performance characteristics investigated. The fan model

chosen was the VM 400 Dex – Model from Rußwurm Ventilatoren, Germany, Figure 1.

The simulations were done in an academic study at the Coburg University of Applied Sciences, Germany, using the CFD (computational fluid dynamics) software ANSYS CFX. In the first scenario the fan was simulated operating over the ground and with fresh air only. In this scenario two boundary conditions were analysed, see Figure 2.

As it is known from experience, the fan does not push the wind through the blades only. Due to the high velocity of the air flow through the fan itself, also the air surrounding the fan is pulled with the flow due to viscous shear stresses. The amount of air pulled with the fan jet seems to be, at a first look, quite large. This can be seen qualitatively in Figure 3. The amount of flow rate surrounding the fan is about 5 times the flow rate through the

▼ Figure 1: The PPV fan VM 400 Dex – Model from Rußwurm Ventilatoren, Germany.

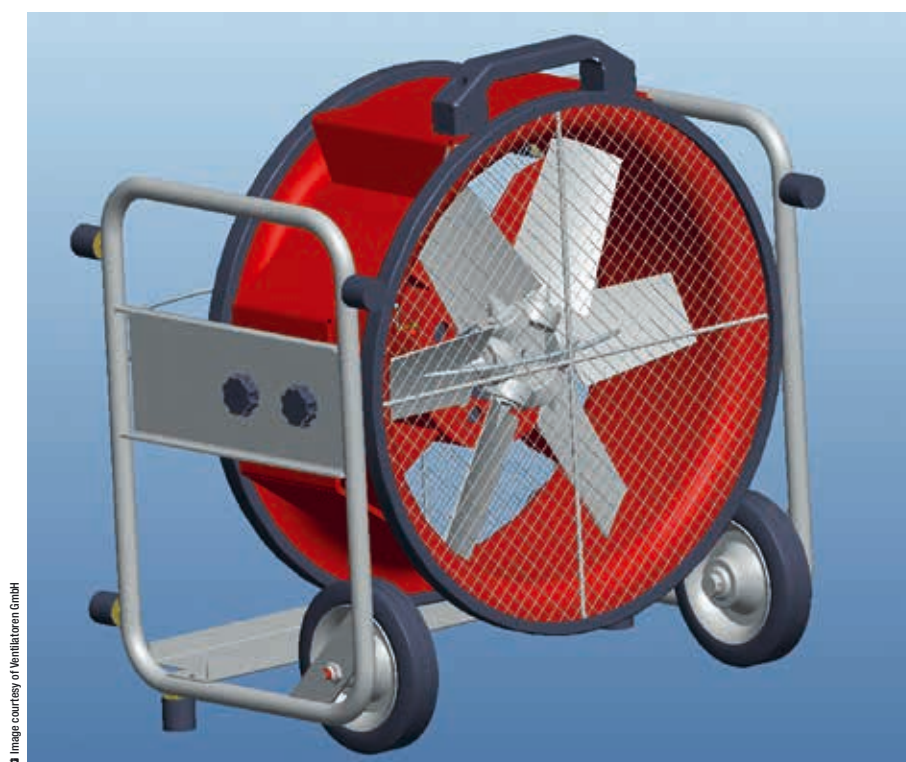


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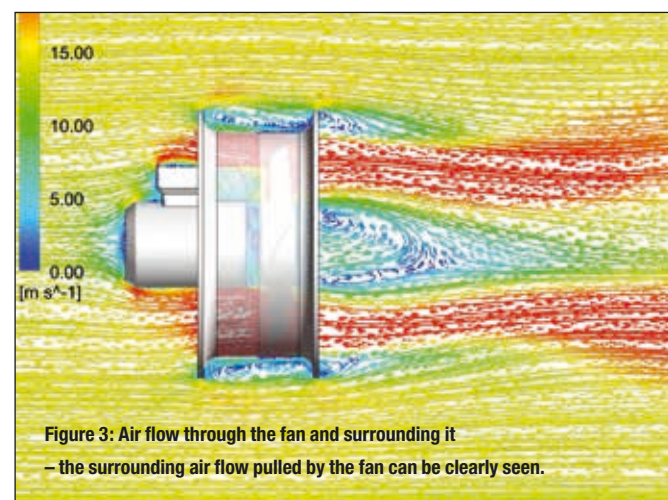
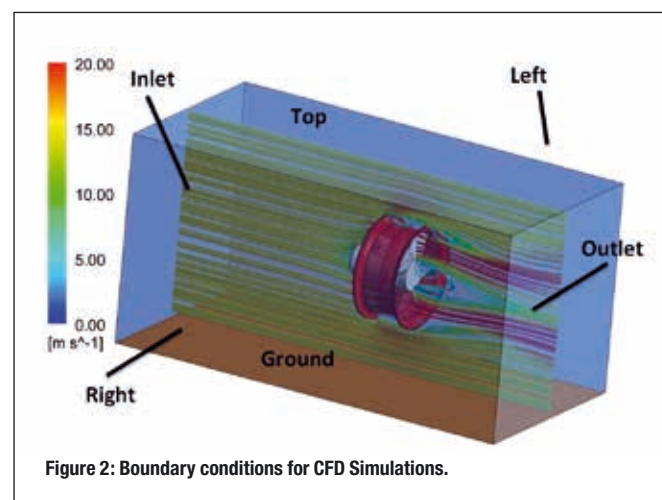
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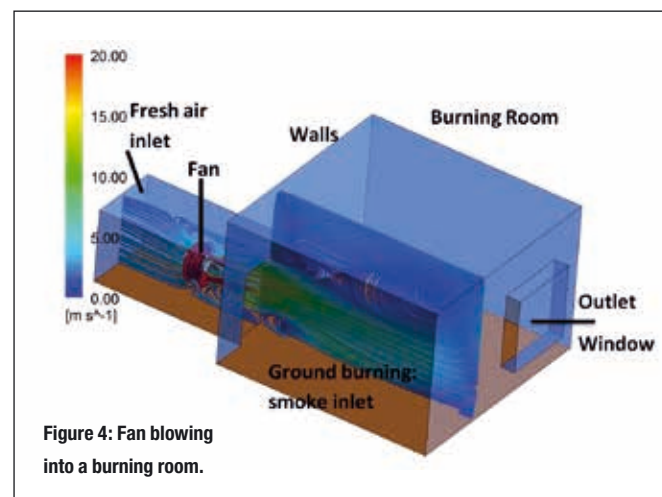
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fan itself. However, here the fan is operating as stand alone. When operating blowing into a burning room of a building, this situation changes. This was analysed in a second scenario.

In the second scenario, the fan was used to blow away the smoky air in a burning room, as shown in Figure 4. This flow

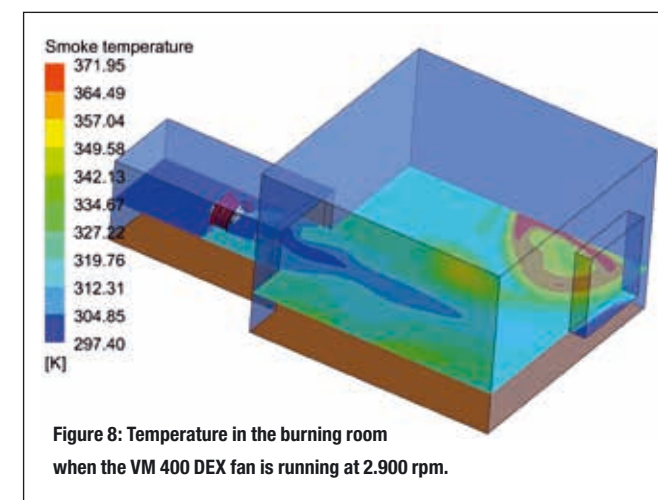
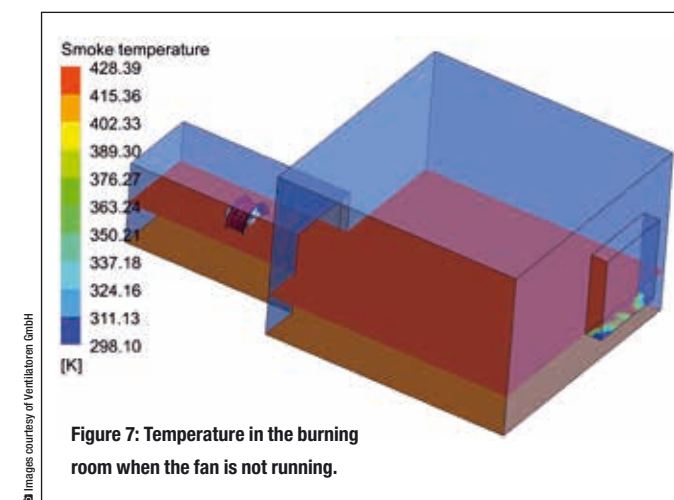
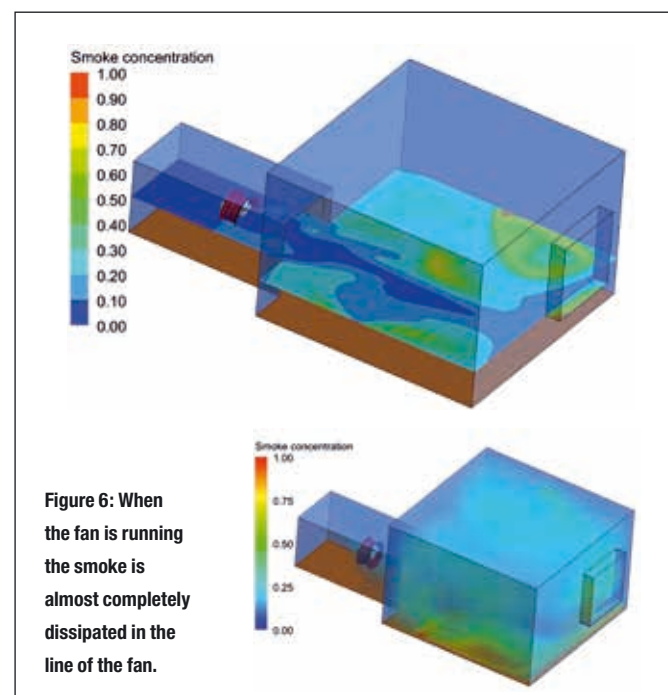
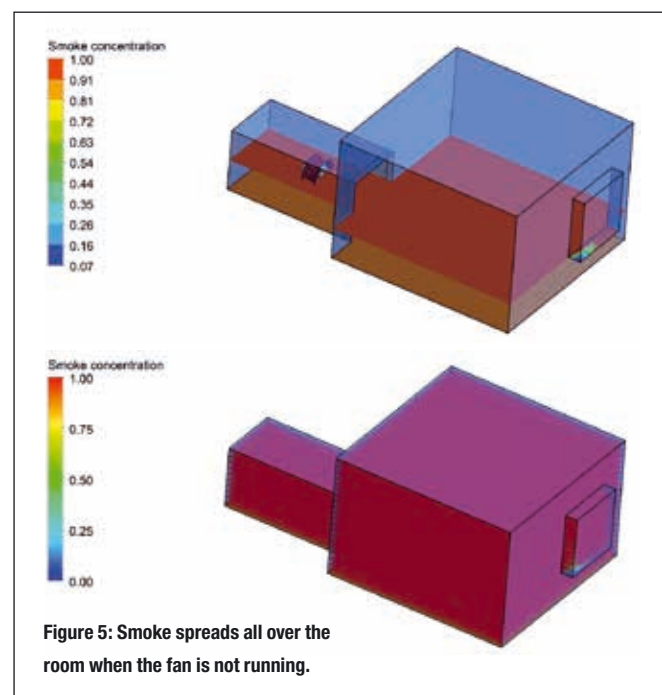


domain consists of a fan outside the building at the left and of a burning room at the right. The ground in the room is on fire and hence generates smoke. In order to consider the fire on the room's ground, a two phase flow numerical simulation was performed. The fresh air is coming in from the far left inlet and the smoke is coming in from the ground of the room. The mixture of fresh air and of smoke leaves the room from the window at the far right. The simulation shows that when there is a fire on the ground of the room, all the room and its adjacent spaces are filled with smoke, as can be seen in Figure 5.

Turning now on the VM 400 DEX at 2.900 rpm, the smoke almost completely dissipates in the line of the fan and also to a large extent in the whole room, making it possible for fire workers to go into the room to fight the fire and rescue people, Figure 6.

A similar effect can be seen looking at the temperature contour plots in the room when the fan is not running, Figure 7, and when the VM 400 DEX is running at 2.900 rpm, Figure 8.

When the fan is running as stand alone, it was shown above that the flow rate surrounding the fan is about 5 times the flow rate through the fan itself. This is, however, only a local effect. When the fan is blowing into the room, the real question is: how



much flow rate is really entering the room, crossing it and flowing out of the window in the opposite side? From the computational fluid dynamics simulations one can read out this data. It comes out, that when the fan is blowing into the building, only an additional 20% of the flow rate flowing through the fan is coming from the fan close surroundings into the building. This can be easily read out from the simulation data when looking at the flow rate coming out of the window and comparing it to the flow rate through the fan in addition to the flow rate coming from the burning ground.

Therefore much care is needed when analysing the PPV fan performance. Doing flow rate measurements through the fan and it's close surrounding only, when the fan is running alone in the lab, will not deliver the right figures. Indeed it will give the wrong impression that the usable flow rate in a building can be as much as 6 times higher than through the fan alone. This is not the case! In reality, for the position of the fan, i.e. the distance from the fan to the room's door, simulated in this study, the flow rate is only 1.2 times higher than the flow rate through the fan alone.

To have a better understanding on the influence of the flow rates in and around

the fan, in an additional study, the walls around the fan were also simulated as opening. That means that the PPV fan was placed in front of the room's door in the open ambient, see Figure 9, and not from a closed room or corridor as in the previous cases. From Figure 9 one can see how complex the flow around the fan can be when placed in the open ambient.

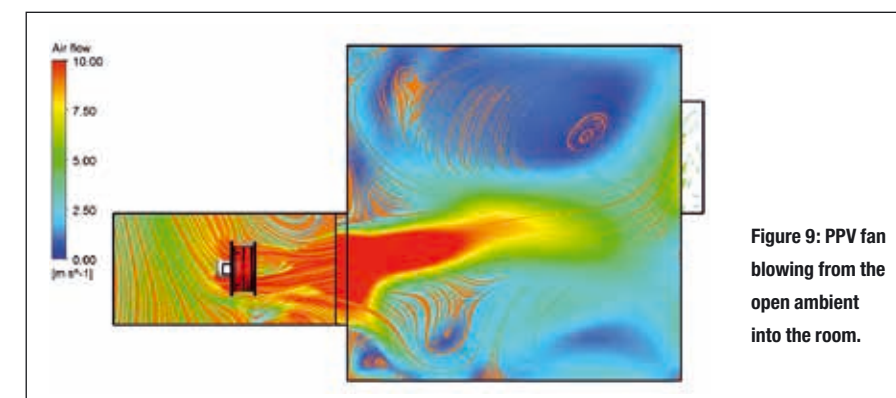
Here two cases were simulated, one without the fire, i.e. with fresh air only and one with the fire coming from the room's floor, i.e. with smoke. In the first case the mass flow of fresh air flowing into the building was about 1.5 times the mass flow rate of fresh air passing through the fan. In the second case, i.e. when there was smoke due to the fire in the room, this ratio was equal to 1.4. One can see from this figures and the figures from the cases mentioned before, that it is not possible to find one unique ratio of fresh air flowing in to the building to the air flowing through the PPV fan. This ratio changes considerably with changing operating conditions. Only in this study four ratios were mentioned: 6.0, 1.2, 1.5 and 1.4. Which one is right or effective? What is the effective flow rate of the PPV fan? To answer these questions, several other

questions have to be answered carefully before one can determine the effective flow rate of a PPV fan, as for example:

- Is the PPV fan being operated from the free ambient into the room or is it operating from a closed ambient, i.e. a neighbour room or corridor?
- What is the distance of the PPV fan from the door?
- How much smoke is being generated by the fire in the room?
- What is the flow resistance of the room, which depends on the size of the room, the number of windows and so on?
- How does this ratio change when changing the rotating speed of the fan (RPM)?
- How does the smoke coming out of the burning room influence this ratio?

In order to have an answer to these questions a systematic study has to be performed to find the bounds in which this ratio can vary. Only then the fireworkers can have a confidence margin for the declared mass flow rate effectively generated by the fan. Especially one has to mention under which conditions the flow rate stated in the fan's specification was measured. Therefore, measuring the effective flow rate of a PPV fan is not a simple task and has to be done under well specified conditions.

Perhaps a new standard base has to be carefully established in order to get reliable data sheets with the effective flow rate through PPV fans which can be really used for firefighting.



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# High speed in-vehicle networks for fire apparatus

Technology in public safety is advancing at an exponential pace. First responders require broadband connectivity at the scene of an incident to support an array of in-vehicle devices, such as laptops and tablets and mission critical applications, such computer-aided dispatch (CAD) and automatic vehicle location (AVL), to enable faster and more efficient responses in the field.



David Markland

**V**ital information provided by these systems, including location, navigation, hazmat and building information, enables first responders to arrive on scene more informed, and better prepared to protect both the public safety and their own.

Fire departments offering emergency medical services require connected EKGs (electrocardiograms), digital fire plans, tracking and telemetry applications, so teams can efficiently attend to fires, begin patient treatment, and coordinate with other first responders and emergency rooms.

While the benefits of technological advances appear obvious, the proliferation of in-vehicle applications, mobile devices, and wearable gadgets is creating a headache for IT teams. Each onboard or wearable device requires a fast, reliable wireless connection and, as the number of applications has

grown, so too has the number of ways to connect them. Firefighters need wireless connectivity that performs as well as wireline networks, and each system needs to be connected securely and managed remotely.

One option that IT Managers are now deploying is purpose-built, high performance vehicle networking solutions. There are in-vehicle routers and gateways available that provide enough bandwidth to support multiple, data-intensive applications and devices. They offer features like Gigabit Ethernet and Gigabit Wi-Fi for the Local Area Network (LAN) or Vehicle Area Network (VAN), and LTE-Advanced to support huge volumes of traffic over the cellular network. These

▼ **The first minute of response time is critical for location, navigation, and hazmat information to plan a crew's approach at the scene.**



Image courtesy of David Markland

David Markland, AirLink Product Management at Sierra Wireless.



▲ **In-vehicle routers such as Sierra Wireless's MP70 provide secure, intelligent communications for mission critical applications, by creating a high performance vehicle area network in and around the fire truck.**

routers also deliver secure, managed and uninterrupted connectivity to enable mission critical applications to communicate back to command and control teams in real time, allowing fire departments to reduce response times.

High performance routers can effectively turn firetrucks into a truly mobile office at an incident scene, enabling all connected technologies to be fully operational up to 800 hundred feet from the vehicle. This is vital for wearable devices used by individual firefighters. New developments in vehicle technology enable the creation of a secure VAN that serves both wired and wireless devices, and connects everything to the department and operations teams via a secure wireless wide area connection (WWAN). With this type of architecture, fire departments can improve firefighter safety and increase effectiveness, by enabling crews to provide the right response at the right time.

So what are the specific network challenges facing fire crews, and how can high performance routers address them?

## Maintaining constant communications

One of the biggest challenges for in-vehicle applications for firefighters is maintaining uninterrupted communication. Firefighters need to be in constant contact with their enterprise-based operations teams to provide real-time scene updates, while also collaborating with medical response teams or law enforcement. This information is easily exchanged when fire apparatus are at the station via Wi-Fi, and administrative tasks such as software updates and uploading/downloading of large data files can be undertaken while on premises.

However, complications arise once the apparatus has been sent on a call. The in-vehicle router is responsible for maintaining the same level of network connectivity that crews experience at the station while the vehicle is on the move. Some solutions attempt to extend the Wi-Fi connection from the station until further down the road, but then disconnect before a cellular connection has been established. This means dispatch data can potentially be off air for between 30 and 40 seconds within the first minute of a call. This nearly one minute loss of connectivity can affect the entire response, especially if average response times are four minutes. The first minute is critical for location, navigation, building

plan/hazmat information, which is key in the overall approach at the scene.

High performance routers allow applications to make a seamless transition between Wi-Fi and cellular networks. Some solutions have the ability to use multiple cellular and Wi-Fi networks, and are able to smoothly manage network handoffs, and can be customized based on department policies.

## Moving data rapidly:

Once reliable connectivity is established, the next challenge for crews is uploading or downloading large files at speed while on call. Building plans and video footage require large amounts of bandwidth and reliable network connections. Carrier deployment of LTE-A networks has paved the way to supporting a wide variety of high bandwidth applications over a single connection. LTE-A improves network capacity and coverage by delivering very high data rates. The faster the network connection, the faster crews can get access to the data they need, and the faster they're able to react at the scene. This includes building plans, bird's eye views, hazardous material information, access and egress routes and fire control systems. Firefighters with body worn cameras can stream live video back to operations using the fire apparatus as a Wi-Fi hotspot. High





performance routers offer the faster LTE-Advanced (LTE-A) connection.

The value for command staff is greater awareness of incident scenes. Rescue personnel can communicate with hospitals, and paramedics on-scene can send EKGs via telemedicine applications through the in-vehicle router, so that when a patient eventually leaves the scene and reaches a hospital, their medical history arrives with them.

#### **Remote network and fleet operations management:**

With all the recent technological advances in equipment, fire departments have recognized the need for a complete management solution that can enable operations, IT and fleet managers to see the location and status of the fleet and configure or update routers, connected devices and mission critical applications over-the-air from a single system. For example, the Seattle Fire Department recently deployed a successful communications solution using high performance vehicle routers. With 33

fire stations and over 60 vehicles including fire trucks, ladder trucks, and medical units, they recognized the need for IT to accurately monitor these mobile devices.

High performance vehicle routers also provide network management platforms that enable remote, centralized monitoring and troubleshooting of network performance for an entire fleet. Centralized network management platforms provide dispatchers with enhanced visibility on the status of critical applications and vehicles, and offer additional accountability in the event of unforeseen circumstances or equipment failures. Maintenance information can be sent directly to the teams who can understand it, and who are responsible for fixing it.

Features such as vehicle tracking to support fleet management operations are also important. Newer routers are incorporating inertial navigation systems, with built-in accelerometers and gyroscopes, to keep track of emergency vehicles when they don't have access to GPS location data. Challenging landscapes and urban canyons often

▲ High performance routers enable connected wireless technologies to operate up to 800ft from the vehicle at incident scenes.

provide teams with environments too difficult for typical GPS systems to work effectively. Mobile routers with inertial navigation systems deliver superior visibility in any circumstance, providing uninterrupted, timely and accurate location information to mobile devices and mission critical applications, while also enabling dispatch teams to monitor vehicle locations and progress on call.

#### **Summary:**

Technology is significantly improving the overall effectiveness of firefighters worldwide. And purpose-built high performance vehicle routers now provide fire departments with sufficient speed, bandwidth and range to support the wide variety of devices and applications that protect firefighters and those they serve.

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# A robust crisis response solution has never been more critical for first responders

Crisis response capabilities are coming under increasing scrutiny in most areas of the world. Globalisation, coupled with population growth and contemporary security issues, is bringing with it a whole new set of challenges to effectively responding to an emergency. From large-scale international sporting events to the ever present threat of natural disasters, the need for intuitive technology that enables a joined-up, collaborative crisis response has never been greater. In Europe and around the world, the clamour for such technology has been getting louder and Intermedix is responding to the call.



**Joel Portice**

**T**he role of technology is becoming more important in disaster preparedness and response because of the need for interoperability and the ability to exchange information simultaneously across multiple agencies. This is important when tackling major fires, where a co-ordinated response can be vital in preventing a crisis from becoming a series of mixed responses and a logistical nightmare.

▼ WebEOC the crisis management tool serving those who save lives.

Agencies across the world recognise that being reactive is simply not an option and that as in so many cases, preparedness is key. While natural disasters cannot always be prevented, having a plan and the tools to manage them in advance has been shown to save lives.

Viewed through this prism, disaster management tools and techniques have changed and improved radically thanks to custom built technology platforms that have moved spreadsheets and whiteboards to web-based software and dashboards.

This move allows for multi-agency coordination and real-time

► WebEOC cross-agency situational awareness.

exchange of life-saving information. While spreadsheets are inherently retroactive, and therefore out of date, the next generation of crisis management software allows real-time gathering and reporting of incidents and information.

Intermedix Global CEO, Joel Portice, has spent time in the UK and Europe introducing the benefits of the system that is driving a global revolution in the crisis management arena. From nuclear power stations to fire departments, the state-of-the-art software, WebEOC, is deployed worldwide because the foundation of effective emergency preparedness is the same across industries the world over.

WebEOC was first developed as a tool for crisis preparedness and response and has additionally evolved to effectively support daily operations and communications. The latest version of the software was released last year and the company is constantly striving to innovate to fulfil its mission of serving those who save lives.

When it comes to emergency response, it is essential to be able to share information as a situation develops. WebEOC allows fire, police and ambulance agencies to receive status reports and notifications, coupled with the ability to notify other relevant national agencies as required. Latest advances include sending and receiving such reports direct to a smartphone, allowing those on the ground at the heart of the inner cordon to have access to the very latest updates as they are happening not after the fact.

According to Portice, Intermedix “connects the healthcare and emergency response and preparedness ‘ecosystem’ which is made up of four components: first responders, healthcare providers, government agencies and commercial corporations. “We’re the only company that has developed a platform to bring all of parts of this ecosystem together in the event of a crisis,” explained Portice. “Any organisation that could be affected by an emergency or disaster, whether it’s manmade or natural, is a potential Intermedix customer.”

Experience counts when responding

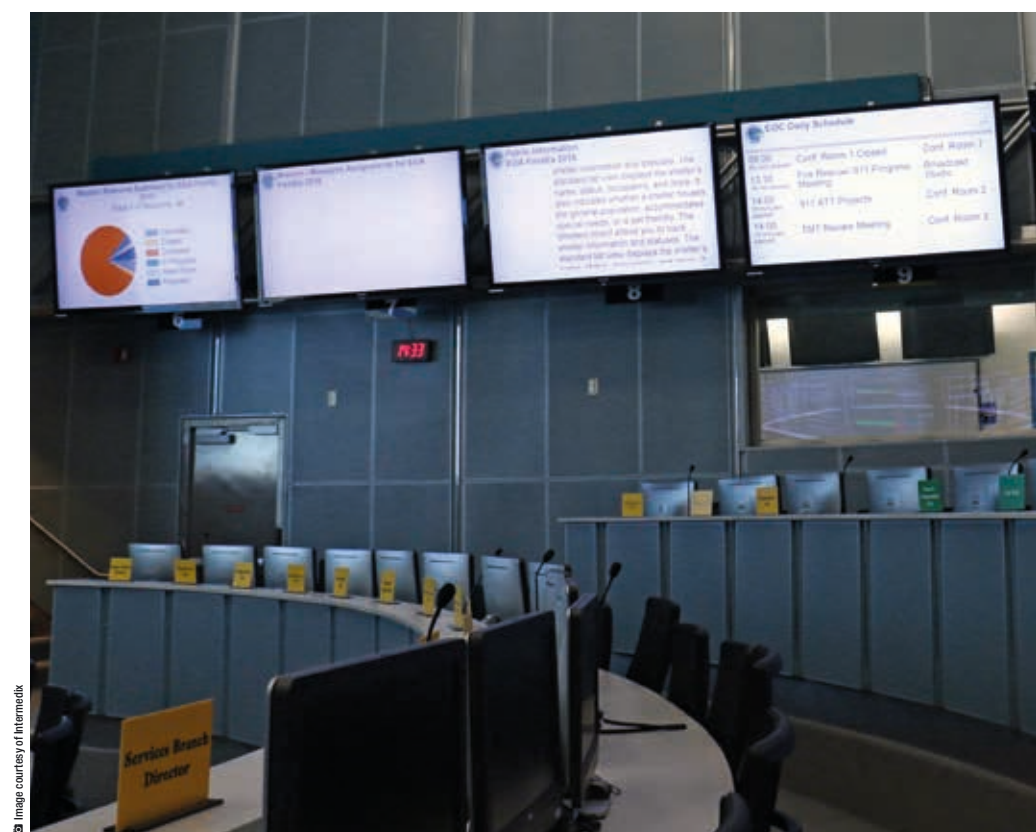


Image courtesy of Intermedix

to disasters, which is why the emergency services carry out so many drills and why Intermedix is trusted to deliver the software solutions. WebEOC allows simulations and real events to be analysed so any lessons to be learned are proactively documented for the future. In the US, WebEOC was used to coordinate the response to the wildfires in San Diego in 2007 and 2015 and the response to the Boston Marathon bombings in 2013. The 2007 San Diego fire blazed through some 380,000 acres of California and led to over 300,000 people being evacuated.

Such a major movement of people during an emergency could not have taken place successfully if the involved agencies did not have a trusted plan in place, and the personnel and the tools to manage it. Thanks to WebEOC, state and local emergency responders were able to draw on experience from past crisis management simulations to deliver a successful outcome. In the wake of natural disasters, open and clear communication within fire departments and between other first responders is critical. The more seamless the communication, the more effective the response can be. This is equally valuable when responding to acts of domestic terrorism, such as the Boston Marathon Bombings.

The official ‘After action report for the response to the 2013 Boston Marathon bombings’ in the US recognised WebEOC as being a key factor in best practice. With a marathon course that crossed eight local territory boundaries, the preparedness, response and recovery involved cross-agency coordination and communication across federal, state and local public safety, emergency services, healthcare providers and medical partners.

It is a reassurance for agencies considering WebEOC to know they are using a system that has been ‘battle-tested’ in a number of different scenarios and has proven itself robust and reliable over many decades of use. WebEOC is now in use worldwide and is recognised as the standard response to every crisis. Correspondingly, Intermedix has always had a global outlook, because crisis management is not restricted to just one country.

Portice explained, “We’re a global company and we have some of the world’s leading experts in our team. Most of the potential disasters that occur in the world have common themes that can be planned for. We will never be able to eradicate the risk of disasters, despite our best efforts, we can make absolutely sure that we

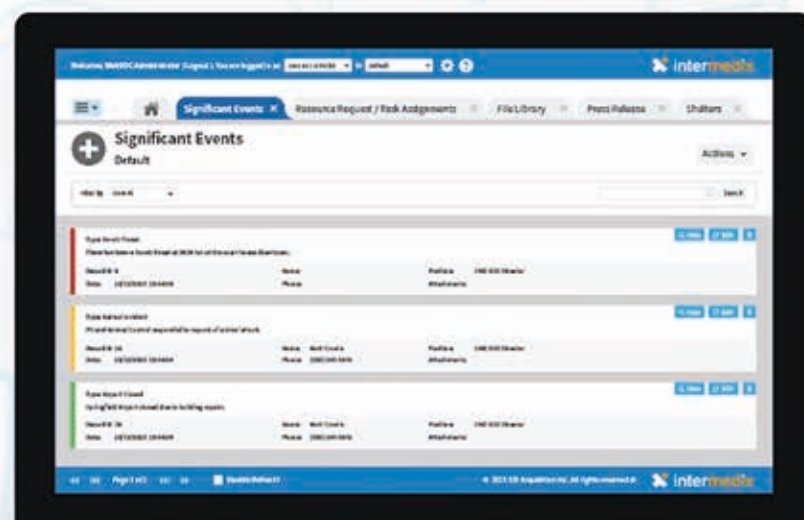


Image courtesy of Intermedix

Joel Portice, Global CEO,  
Intermedix.





▲ WebEOC accessible crisis management technology.

are as prepared as possible for any eventuality.

WebEOC supports the emergency preparedness professionals that need to be prepared for these eventualities with accurate, real-time information surrounding incidents and the ability to access information from multiple locations. Live information can be shared between responders, and once approved, non-classified data from WebEOC can be shared with the public and media as required.

As for the future? Portice said: “We will continue to innovate and advance the ways in which we serve those who focus on their priorities of saving lives and limiting damage. We are investing in our European base in the UK, and with this I will be spending more time in Europe to develop relationships with our European partners.”

There has been a growing appreciation in Europe that proven crisis management software can prove useful in a host of situations, which has led Intermedix to enhance its presence

with a new UK headquarters in Reading, Berkshire to support these emerging European clients. The advantages of using a system that has already proved its worth on the global stage is attractive to those continental agencies who need tailor made solutions that meet their needs today and are customisable for the challenges of tomorrow.

“We’re an international company with a global staff and a global mind-set,” added Portice. “We have expertise in EPRR (Emergency Preparedness, Resilience and Response) nuances in different countries and different cultures throughout the world. I’m proud we have some of the world’s best technology and analytic innovators working at Intermedix, as well as leaders from an EPRR and first response background, many of who themselves have personal experience of front-line emergency response.”

Intermedix is an established company with proven global technology solutions, serving emergency responders, government agencies and corporations. It has more than 2,500 employees around the globe and provides services and solutions in more than 25 countries located in North America, Australasia and the Middle East.

The company’s crisis management solutions are used by more than 15,000 customers, including government state and federal agencies, emergency responders, military, healthcare providers, energy plants, and corporations. It is estimated that in every single major incident in the US, at least one agency involved will be using the company’s WebEOC technology to manage the crisis response and post-event recovery. Intermedix aims to continue investing in WebEOC to deliver the same levels of service as part of the firm’s ongoing European expansion programme.

“At Intermedix we have a simple mission. It’s six words: To serve those who save lives. Our whole focus is to use our technology, our people and our resources, in order to help those responders focus on their mission. We will continue to do that and I think that comes across, not only in better technology, in more precise analysis and information, it comes from doing everything we can to promote and enhance the communication between agencies,” concluded Portice.

➔ For more information, go to [www.intermedix.co.uk](http://www.intermedix.co.uk)



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— SINCE 1953 —



# A new era for incident control?

There are a number of challenges associated with the management and reporting of fire and rescue incidents. Traditional methods of whiteboards, paper-based reporting and Vehicle Mounted Data Systems (VMDSs) have by their nature taken incident commanders and command teams away from the fire ground and into vehicles. The inaccessibility of information has meant resources that are designed to support decision making and incident control are not always used to their full capability.



**Thomas Hennessy**

**T**he need to capture a more comprehensive picture of key events and critical decisions made during an incident and to increase the accessibility of information on the ground is leading to a shift towards more intuitive and responsive ways of managing incidents through mobile technology.

Here Thomas Hennessy, business development executive at Incidentcontrolroom.com® discusses the limitations of traditional approaches to incident control and explores the use of mobile technology to improve real-time decision making and reporting.

## Assessing traditional approaches

A National Incident Command System (NICS) has been developed to enable good practises to be embedded and deployed consistently when managing fire incidents across the UK and Ireland.

Typically, when an incident occurs, the incident commander appoints a command support officer who is responsible for capturing the incident information, documenting decisions, creating the incident log and reporting key information back to the control centre, such as dynamic risk assessments and tactical mode data.

The command support officer may update an Incident Command Board (ICB) situated in a vehicle during an incident to give a transient record of events. At the end of every incident, the incident commander would then fill in a fire report, which is stored as the main legal document.

Vehicle Mounted Data Systems (VMDSs), comprising of a rugged laptop mounted in the front of a vehicle, are

▼ ICR: Fire and Rescue™ is used by 65% of all fire services in Ireland.



Image courtesy of Thomas Hennessy

Thomas Hennessy is Sales Manager with Incident Control Room.

also commonly used. The VMDS stores information such as guidelines on how to disassemble a car, mapping systems for local water sources, pre-fire plans for higher risk buildings and access to railways and other essential services. A chemical safety database may also be included, consisting of emergency action codes and instructions for dealing with chemical substances.

There are a number of limitations associated with the use of VMDS technology to manage and record incidents. For example, security and password protected areas can make the system difficult to use. Due to the inaccessibility of information from the fire ground, fire fighters can be reluctant to access the information and may only occasionally use the resources available. ICBs also have restrictions such as no date and time stamp functionality, limited space to write and the inability to share information offsite.

## Going mobile

In recent years, more and more fire services are adopting mobile technology. For example, 65 per cent of all fire services in Ireland now use a mobile application called ICR Fire and Rescue™.

There are many factors that are driving this increased adoption. Perhaps most importantly, it is widely accepted that the incident command team are more useful on the fire ground, as opposed to in a vehicle. Mobile technology can move information from the vehicle, closer to the incident ground and into the hands of the incident commander.

By increasing the accessibility of information, a fire service can ensure it is more widely used, encouraging best practise and ensuring compliance with procedures. Using handheld devices, officers can easily refer to standard operating guidelines (SOGs) and have instant access to a library of information, which is particularly useful to support the decision making process when handling more unusual incidents.

The need to share information offsite, for example, with the control room, is also a key driver for the use of more mobile systems. Remote access means that officers back at the station can log in and access up to date incident progress, as well as photographs directly from the scene of the incident.

In addition, the ability to record what is happening on the fire ground and capture events as close to real-time as possible is



a major advantage when compiling reports after an incident, and also helps to support health and safety procedures and future training activities.

As well as improving incident control, fire services can also generate cost efficiencies by implementing mobile technology. Tablets are relatively inexpensive compared to rugged laptops which need to be regularly maintained.

## Using mobile technology: a case example

Kildare County Fire Service is just one example of a fire service that has successfully migrated from traditional approaches for incident control to the use of mobile technology.

Kildare County Fire Service provides a fire service to a population of over 210,000 citizens in County Kildare, Ireland, consisting of approximately 100 employees spread over six fire stations. Last year alone, the service responded to 1760 incidents.

Niall Burke, senior assistant chief fire officer at Kildare County Fire Service was first introduced to ICR Fire and Rescue™ at the Chief Fire Officers Association (CFOA) conference in 2014. He said: "We recognised that the technology we were using had become outdated, stagnant and restrictive in nature. We had received many requests to make the VMDS more mobile but couldn't find a way to do it."

Initially four station officers trialled the software and were asked to evaluate whether it was something that would support teams on the fire ground. After a successful review period, the technology

▲ Celina Barrett, Chief Fire Officer at Kildare County Fire Service and Ben Woodhouse, Station Officer at Athy Fire Station.

was rolled out across all six fire stations.

Niall explains: "The library of information stored on ICR is continuously developing into a rich resource and information hub that can be accessed on the fire ground. Having accessibility to this information is invaluable and reading it on a tablet at the incident scene is much more efficient than as a PDF back at the vehicle. The information can also be used as a training resource to promote continual best practice."

"The app helps us to deliver consistency around the application of the National Incident Command System (NICS). As you work through the various screens you are prompted to record dynamic risk assessments, tactical modes, sectorisation, operational priorities and personnel on the fire ground. I have also been impressed by the speed at which an incident report can be generated using real-time data."

By migrating from a legacy VMDS to an app-based solution, Kildare County Fire Service has been able to increase access to information at the scene of incidents, as well as improving reporting procedures, in real-time and post-incident. The system has led the way for a wider mobile computing strategy at the fire service, opening the door to other mobile applications, all with the aim of making the role of fire fighters simpler and safer.

➡ For more information, go to [www.incidentcontrolroom.com](http://www.incidentcontrolroom.com)



# The physiologic effects of turnout gear

Turnout gear, also known as thermal protective clothing (TPC), is an encapsulating garment that is typically worn with respiratory protection. These garments protect the firefighter from external heat and flame but the tradeoff when donning these garments is impaired ability to dissipate internal heat created from the exertion during fireground and rescue operations. These garments also impair movement and reduce the firefighter's maximal workload.



David Hostler

**C**hemical protective garments, such as Tyvek, are lighter than TPC but the formation of a complete barrier to evaporation makes it nearly as stressful. Regardless of the risks associated with TPC, these garments must be worn when working in hazardous environments and the characteristics of these garments is unlikely to change in the near future. Therefore, it is important to understand the effects of TPC on the firefighter and plan ahead to mitigate the heat stress.

The body is not a single temperature from the skin to the core. The brain manipulates the body systems to keep

the core temperature higher than the skin temperature. By maintaining this gradient, we can transfer warm blood from the core to the skin when we are too hot and pull blood away from the skin if we become too cold. The firefighter is at risk of injury if core temperature rises faster than heat can be dissipated through the skin. There are five ways a human can gain or lose heat in order to maintain body temperature in an acceptable range. The most important method for shedding excess heat to the environment is to increase blood flow through the skin, produce sweat, and allow the sweat to evaporate. The process is normally very



◀ Firefighter physiology testing in the Emergency Responder Human Performance Lab at the University at Buffalo.

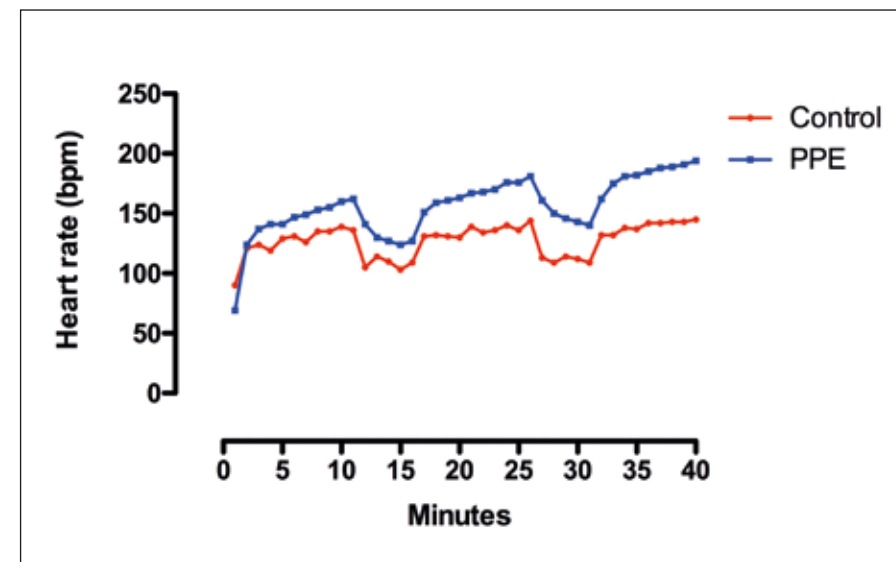
David Hostler, PhD, NRP  
University at Buffalo  
Department of Exercise and  
Nutrition Sciences  
Center for Research and  
Education in Special  
Environments.

► Figure 1: Heart rate response of a subject walking on a treadmill in athletic clothes (red line) and in chemical protective clothing (blue line). See the text for a description of the study.

efficient unless the environment is very humid or the skin is covered by garments, both of which inhibit evaporation. The firefighter suffers both of these issues when wearing TPC. The sweat produced as the firefighter's temperature rises cannot efficiently evaporate through the TPC creating a wet environment between the TPC and the firefighter's skin. Additional heat stress is suffered when the radiant heat from the fire or the sun warms the firefighter externally.

Sweating can further aggravate heat stress by reducing the amount of blood available to carry oxygen to the working muscles. Sweat is produced from the liquid component of blood and heavy sweating causes a progressive dehydration. This can be quite rapid during fire suppression. In our experiments, a single 20-min. training fire can result in a firefighter losing as much as 1-kg of body mass from sweating. Longer bouts of lighter intensity work in TPC can result in nearly 2-kg of lost body water from sweating. Dehydration forces the body to work harder to accomplish any given task. The heart must beat more rapidly to move the reduced volume of blood to the working muscles. As dehydration becomes more severe, the amount of blood that can be diverted to the skin is reduced and heat stress becomes worse.

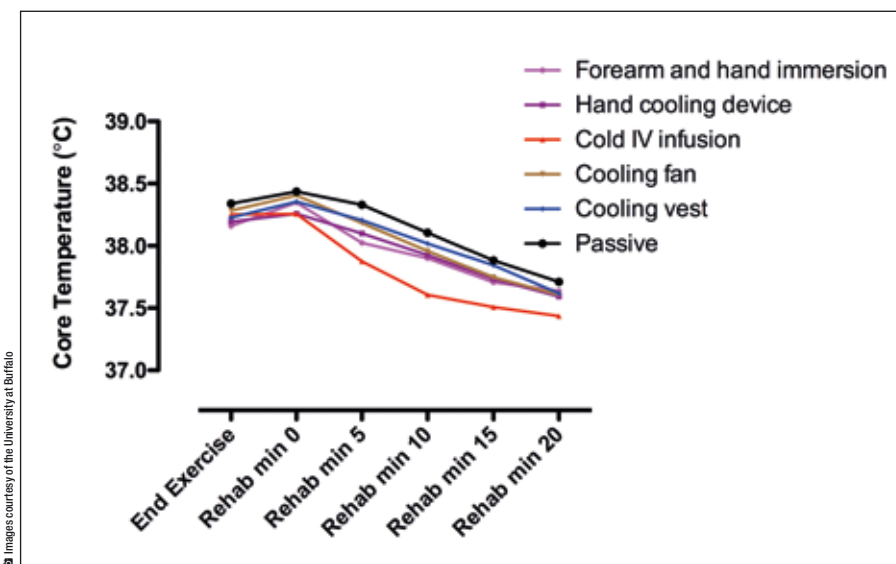
The sum of these physiologic challenges is exertional heat stress (EHS). High heart rate, high core temperature, rapidly rising skin temperature, and rapid breathing characterize EHS. This condition can occur in many settings of sport and occupation but, for the reasons discussed above, the firefighter can do the least to avoid or slow the onset of EHS. Figure 1 most clearly demonstrates EHS and the effect of protective clothing on physiology. In this graph of heart rate during exertion, a young healthy male carried a 4.5-kg tool and walked on a treadmill at a comfortable pace and mild incline. After 10 minutes, he walked more slowly on a level plane for five minutes to allow for partial recovery. This was repeated three times. The red line shows



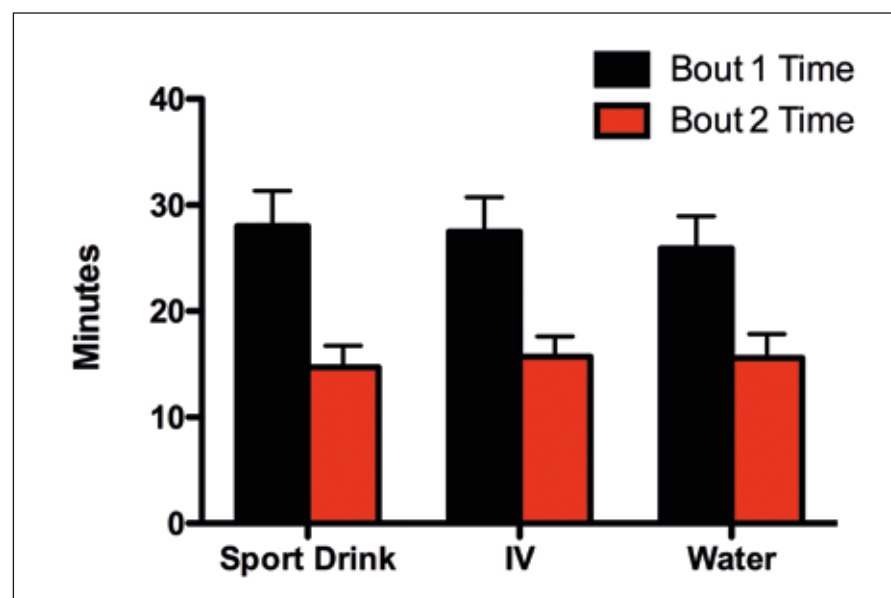
the subject's heart rate response when wearing short pants and a short sleeve athletic shirt. Notice that the heart rate response is very consistent through exercise. In comparison, the blue line shows the heart rate response when wearing a Tyvek coverall and filtering facepiece respirator. Each subsequent bout of work results in a higher heart rate and incomplete recovery. By the end of the third bout, his heart rate was nearly maximal even though he was still at a walking pace. This is the picture of exertional heat stress. The subject was sweating heavily under the garment. The sweat could not evaporate so the subject has less circulating blood volume causing the heart to beat more rapidly and the subject's core and skin to rapidly rise. Firefighters subjected to this type of stress without adequate rest and recovery intervals will become too fatigued to continue working or suffer a heat illness.

Heat stress during fireground and rescue operations is unavoidable. Devices that can be worn under TPC to cool the firefighter are either not practical or not effective. Heat stress must be mitigated at regular intervals by rehydrating and by providing a cooling interval. There are a few simple rules that can be applied to enhance recovery

▼ Figure 2: Six cooling modalities tested after exertional heat stress. Note that all of the modalities only perform about the same as passive cooling performed in a comfortable (~22°C) environment. Also note that core temperature had not returned to baseline (~37°C) after 20 minutes of cooling. Redrawn from Hostler et al Comparison of active cooling devices with passive cooling for rehabilitation of firefighters performing exercise in thermal protective clothing: a report from the Fireground Rehab Evaluation (FIRE) trial. Prehosp Emerg Care. 2010 Jul-Sep;14(3):300-9.







▲ **Figure 3:** Firefighters performed exercise in TPC until exhaustion (black bar). They were then rehydrated with sport drink, water, or IV fluids. They then performed a second bout of work in TPC until exhaustion (red bar). The choice of fluid did not affect the time did not affect the work time after the recovery interval and the second bout of work was typically shorter than the first. Redrawn from: Hostler et al Comparison of rehydration regimens for rehabilitation of firefighters performing heavy exercise in thermal protective clothing: a report from the fireground rehab evaluation (FIRE) trial. Prehosp Emerg Care. 2010 Apr-Jun;14(2):194-201.

after exertional heat stress. The first and most fundamental is to remove as much TPC as possible. These garments contributed to the exertional heat stress. Wearing them during the recovery interval is counterproductive. At a minimum, the firefighter should remove helmet, hood, coat and gloves. There is an additional benefit to pushing the TPC pants down around the boots when the firefighter is sitting. Temperature will be high at the beginning of the rest interval so removing garments and rolling up long sleeves will allow the sweat to evaporate. Remember that evaporation is impeded by humidity so you may have to move the recovery area indoors or into an air-conditioned vehicle when the ambient humidity is high.

Allowing the firefighter to passively cool is effective when TPC is removed and the recovery area is placed in a cool, non-humid environment. We conducted a study comparing five cooling devices to

passive cooling in a room temperature setting and found that all modes, including passive cooling, worked equally well (Figure 2). It is worth noting that temperature does not return to baseline after 20-30 minutes of rest. Firefighters who perform another bout of work after the rest interval are starting at higher heart rates and temperatures than normal and, after the recovery interval, they most likely will not work as long or at the same intensity as the previous bout of work.

Passive cooling, however, will not be as effective in hot or humid conditions. In these situations, a fire department will have to find a rest area that is indoors or in a vehicle or choose to invest in active cooling devices. One of the simplest devices available are 20 L buckets filled with cool water that the firefighter uses to immerse his hands and forearms. This form of conductive cooling removes heat from the blood in the superficial veins before it returns to the central circulation. Over 15-20 minutes, this can be very effective at cooling the body (Figure 3). Research from our lab and others has shown that other devices, such as cold towels and fans, are largely ineffective when the environment is hot and humid.

Rehydration is an important part of recovering from exertional heat stress. As shown above, the fluid lost from sweating while working in TPC is substantial. Most firefighters will not drink enough fluid during the rest interval to fully rehydrate. In fact, it may not be possible for many individuals to consume that much fluid in a short period of time without suffering gastric distress. The individuals must be

counseled to continue drinking after the incident concludes in order to be effective during the remainder of the shift. The type of fluid that should be consumed is a hotly debated topic. Most advocate using plain water for rehydration although a very recent study reported that certain beverages such as milk and electrolyte solutions remain in the system longer than water when consumed after exercise. Beverages with high sugar content, such as soft drinks, should not be used to rehydrate after heat stress, as there is the potential for mild kidney damage.

Lastly, it is important to understand what can be accomplished in the recovery interval. Firefighters in our studies often report feeling fully recovered 10-15 minutes into the recovery period. This is probably due to the rapid skin cooling that occurs when TPC is removed. In fact, good rehydration and cooling practices only partially corrects the physiologic strain caused by exertional heat stress. It cannot reset the firefighters physiology back to baseline. The residual heat and dehydration after the recovery period will not allow the firefighter to work at the same intensity or duration as the previous bout (Figure 3). Prolonged incidents will require more manpower to minimize the chance of a firefighter becoming overly fatigued and suffering an injury.

In summary, firefighters at every level must understand the physiologic strain caused by TPC and working on the fireground. The most important lesson to learn is that TPC should be removed every time it is safe to do so. This will prevent further heat stress and may correct some of the heat stress that has already occurred. Firefighters should work to maintain normal hydration throughout the shift. Do not overhydrate, but regularly drink small amounts of fluid throughout the shift and somewhat larger amounts when you are sweating. It is a good practice to drink a liter of fluid in the hour following an incident to be prepared for the rest of your shift. Lastly, getting hot is part of firefighting but it is not healthy to have high body temperatures for long durations. Take every opportunity to cool off and be prepared to deploy an active cooling strategy when the weather conditions will not permit efficient passive cooling.

➔ **For more information, go to**  
[www.firefighterresearch.org](http://www.firefighterresearch.org)

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# Standard of operation for cave rescue in Hungary

In Hungary specialized cave rescue teams undertake the rescue role when explorers and researchers become stuck in caves. These organizations have adopted a unified procedure for undertaking cave rescues. During a cave rescue the interest of the casualty has priority and any other issues are dealt with as a secondary issue. Careful consideration must also be given to any circumstance which may endanger the health or safety of the rescuers.



**Colonel Péter Jackovics**

Colonel Péter Jackovics, civil protection counselor, Head of Department for Emergency Management, National Directorate General for Disaster Management (NDGDM), Ministry of the Interior, has two decades of professional experience in domestic and international disaster relief and assistance. He is the commander of HUNOR. He led the governmental rescue team in Sri Lanka, Indonesia, Haiti, Malta and Serbia. He is Hungary's UNDAC expert. As deputy head of the EU civil protection team, he directed the assistance granted by EU countries to Japan. Under his leadership, the basic professional requirements, the National Classification System for voluntary rescue organizations to be deployed in rescue operations have been elaborated in the six different branches of rescue. At present, he is a student of the Security Science Doctorate School of the Óbuda University. His area of research is the risk mitigation of special rescue operations during disaster assistance.

**T**he chief rescuer and the head of every rescue action group have sole responsibility for measures to be implemented.

Others involved at the rescue, regardless of their rank or status in their own organization must follow or execute the instructions of the chief rescuer.

All participants involved in the rescue will only be nominated tasks which they are competent to fulfill.

The unified procedure is based on the Hungarian Cave Rescue Services' elaborated and approved policy.

The surface control party and all

independent mobile action groups involved in the rescue can be directed by cave tour leader or search master.

Those entitled to lead any of the rescue phases or to take over the leadership of the rescue, must possess the required skills:

- a) Until the arrival of additional helpers' (co-rescue), the cave guide involved in the accident (tour, search), in case if their incapability its appointed replacement, in their absence any other who is present and able to perform the task.
- b) In the case of additional ad hoc help arriving (expanded co-rescue) the most suitable: the most experienced, qualified person with suitable management ability, good physical and psychical condition, with exception of those participants involved in the accident.



Image courtesy of NDGDM

► Voluntary USAR team is demonstrating technical rope capability to construct a system that allows for the movement of a load with victim from a high point laterally to a safe point below.

- c) When the cave rescue service gets arrives (rescue service rescue), it is compulsorily for the head of the rescue service to take control.

Anyone involved in the cave accident or those who are not capable, cannot be in charge of rescue.

In the case of a cave accident, the injured person should be put in safety place, provide urgent first aid applicable to the circumstances and abilities, following the condition survey and the status evaluation and proceed as follows:

- a) Alert the cave rescue service without delay in case of serious injury or if it is believed people are in danger. The rescue of the injured must be carried out by the cave rescue service action under the supervision of the medical team / doctor using the special rescue stretcher.
- b) If the severity of the injury can not be judged clearly, the condition of the injured person(s) must be presumed as serious;
  - i. In the case of a minor injury and if the condition of the injured is suitable, the delivery to the surface can be started in a co-rescue or rescue action.
  - ii. In parallel with the rescue it is obligatory to notify the Disaster Management Service and the National Ambulance Service.

## Requirements of Cave Rescue Service

A cave rescue service (an organization which undertakes cave rescue) must be able to alert and have appropriate members of staff available to get in action as well as a competent rescue doctor and the necessary medical equipment.

The cave rescue service is obliged to make available on the internet continuously its operational area, up-dates on availability, alerting arrangements and list of members.

Every cave rescue service has to be



able to implement first phase activity, in any domestic cave, independently from the usual difficulties of the approaching route to the accident scene.

To determine the resources required for the rescue the available data has to be taken into consideration; seriousness of injury, place of accident and access difficulties.

Rescue of the injured person can only be started if all the necessary resources are available on site. The decision on the minimum number of members of a cave rescue service required has to be calculated with a maximum 90 minute assembly time, and 50% action-entry rate.

## Degrees of cave rescue in Hungary:

- 1 (light): completing a complex rescue on easy terrain slightly or seriously injured person, includes first degree rescue service operation, obstacle-clearing of rescue route, rescue of injured person;
- 2 (medium heavy): completing a complex rescue of a very seriously injured person on easy terrain or a seriously injured on medium heavy terrain, includes first degree rescue service operation, providing necessary logistic background and resupply;

▼ Central voluntary rescue organisation is using rope technique. Annual exercise is holding on formal industrial area at Budapest in 2015 winter.



Images courtesy of NDGDM





Image courtesy of NQDQM

◀ Rope rescuers in HUNOR were trained by expert from Hungarian Cave Rescue Organisation. Picture was taken at HUNOR INSARAG Reclassification Exercise at November 2012. UN Classifiers are watching the rope rescue operation.

- on at least medium terrain within 1 year, or maximum of 2 years;
- learns both theoretical and practical knowledge of cave rescue equal to domestic and international norms and pass the exam;
- Continuously practices cave touring or cave search and cave rescue;

**A candidate is considered proficient in cave rescue when:**

- Minimum three years continuous, certified, regular membership;
- Active participation at least six times in medium heavy, domestic, complex cave rescue exercises;
- Continuously experiencing cave expedition, cave rescue;

A cave or cave section can be classified as easy, medium difficult or difficult in relation to cave rescue difficulty rating, namely:

- easy: if there is no need of rope protection for a generally experienced caver to explore the route, takes no longer than three hours (calculated with continuously moving experienced team of five members)
- medium difficult: if the route contains not more than two climbing-rope sections in addition to the easy rating;
- difficult: all routes more complex than the previous ones;

The route should be upgraded by one grade if the exploration is effected by specific complicating factors such as:

- risk of landslide,
- flooding,
- significant stenosis,
- longer narrow sections,
- extreme climate conditions,
- equipment supply difficulties,
- significant access difficulties to the cave entrance

➔ For more information, go to [www.okf.hu](http://www.okf.hu)  
[www.caverescue.hu](http://www.caverescue.hu)

- 3 (heavy): completing a complex rescue of an injured in any condition, includes first- and second degree rescue service operation;
- 4 (burden): completing a cave rescue of more than 24 hour duration on heavy terrain, includes third degree rescue service operation;
- 5 (extreme): completing a rescue of more than 24 hour duration, requires mobilization of extreme capacities (i.e. many people, international collaboration, specialist knowledge, special means, complex technical systems);

**Required capacity for each degree of rescue:**

**1 (light)**

- medical crew of minimum 4 people professional staff of which at least 2 paramedic, all have cave tour experience, possibly having cave tour course;
- practiced cave rescuer of minimum 6 people, of which at least 4 skilled cave tour leaders or search leaders with experience;
- less practiced cave rescuers of 6 people, of which at least 2 skilled cave tour leader or search leaders with experience;

**2 (medium heavy)**

- medical crew of minimum 4 people

professional staff of which at least 2 doctors all who have cave tour experience, possibly having cave tour course;

- practiced cave rescuer of minimum 12 people, of which at least 6 skilled cave tour leaders or search leaders with experience;
- less experienced cave rescuers of 6 people, of which at least 2 skilled cave tour leader or search leaders with experience;

**3-5 (heavy)**

- medical crew of minimum 6 people professional staff of which at least 3 doctors all have cave tour experience, possibly having cave tour course;
- practiced cave rescuer of minimum 30 people, of which at least 15 skilled cave tour leaders or search leaders with practice;
- at least 20 less practiced cave rescuers;

The Cave Rescue Service has to undertake a major training exercise every second year to deal with cases of 4-5 degree rescues;

**Conditions of Cave Rescue Service regular membership, on probation:**

- actively participates in a complex training exercise of at least medium or heavy cave rescue domestic exercise

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# Fire fighting decontamination – long term leadership in occupational health

The modern world of firefighting is a constant game of “cat and mouse” as our domestic world undergoes constant change and improvement. New building materials are created all the time and construction techniques continually change. However as these materials and methods change, they also conversely affect the very nature of the operating environment that a firefighter has to work under in an emergency situation.



**Dr David Crouch**

Dr David Crouch, Associate Director – Product Management (Military & Civil Defence) at Scott Safety.

**T**irefighters now face a dichotomy of threats in that they must respond to emergencies in buildings that could be hundreds of years old, creating one specific set of threat conditions, whilst in the next moment respond to a modern building fire with a completely different set of hazardous conditions. For example modern plastics/composite materials such as Nylon, Polystyrene and Polyvinyl Chloride (PVC) will all degrade in a fire to yield noxious gases such as a hydrogen chloride, hydrogen cyanide etc. as well as cancer causing particulate materials such as naphthalene and alpha-pyrene. Older buildings which may contain asbestos or lead containing materials in their construction pose just as much a risk to the firefighter if not more so. Again these risks are common to the firefighter in his or her daily operating environment and do not include the more exotic hazards encountered in other areas of the first responder domain e.g. CBRN or HAZMAT incidents.

During a fire, firefighters wear self-contained breathing apparatus (SCBA) to protect themselves against acutely toxic concentrations of combustion products. However after a fire has been extinguished, fire-fighters undertake overhaul, a phase when potential reignition sources are extinguished and site investigations begin. During this overhaul period, fire-fighters can be exposed to potentially harmful concentrations of residual combustion related particulates, gases, and vapours such as carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulphur dioxide (SO<sub>2</sub>), and more than 120

volatile organic compounds (VOCs), including carcinogens such as benzene, 1,2-butadiene, formaldehyde, naphthalene, styrene, and toluene. Formaldehyde is of particular concern in this group, given its status as a known human carcinogen and upper airway irritant. Although it is recommended that fire-fighters use SCBA during overhaul, many fire departments either do not require or do not enforce this procedure.

As a result of this increased operational risk to fire fighters, respiratory protection has now been developed to cover a wide range of firefighting scenarios utilizing both positive and negative pressure environments within the single respirator face piece. As one approach considered by fire departments to the above issues has been the use of APR, rather than SCBA during overhaul operations. For example researchers in the United States have demonstrated that air purifying respirators (APR) fitted with chemical, biological, radiological, and nuclear (CBRN) canisters may reduce occupational respiratory exposures in the fire fighting domain. Designed for Top Down Convertibility, masks such as the AV-3000 HT face piece (Figure 1) are an example of this new requirement and can be configured to operate in either APR, PAPR or positive pressure breathing apparatus (SCBA or airline supplied) modes.

The health risks entailed by fire-fighters work situation can not only lead to cancers, but other health problems such as fertility disorders, cardiovascular diseases, asthma and other allergies such as dermal and



Image courtesy of Scott Safety

respiratory sensitization. Whilst the above respiratory protection will shield the wearer from these hazards from an inhalation perspective in a fire, it will not protect them from the long term chronic effects of contaminants adsorbed into their equipment. Long term exposure, through dermal transfer and ingestion, for example can lead to “chronic” accumulation of these carcinogenic materials into the body. If not properly addressed through correct cleaning and decontamination protocols this problem can result in long term damage to the fire-fighters health. For instance the fire-fighters’ work environment is a global problem and several types of cancer are now classed as an occupational illness for fire-fighters in Sweden, Canada, Australia and parts of the USA

Present strategies for alleviating combustion product contamination of firefighting equipment and personnel is very rudimentary and usually involves either routine washing via laundry of the equipment & clothing or direct replacement of the aforementioned equipment. Cleaning of such equipment & clothing is normally undertaken on a

cyclical basis (e.g. once every 3 months) via laundry services specifically designed for such apparatus. Whilst effective, this service is a huge logistical burden in requiring large quantities of water and detergent per unit cleaned and is only undertaken sporadically over a prolonged period of time e.g. not after every incident. As a result there is an increasing likelihood of exposure to the aforementioned contaminants and therefore prolonged accumulation in the body, which can ultimately result in chronic effects being observed longer term in firefighters.

To combat this human tragedy a significant amount of research is now being undertaken across the globe to find alternative methodologies which could be used to help reduce the

▲ **LDS – Multi-purpose system for all CBRN/HAZMAT and PPE decontamination needs.**

occupational exposure fire-fighters receive during their daily life. One alternative methodology that could conceivably be used in the future fight to reduce occupational exposure is that of dual fluid atomization technology. Dual fluid atomization systems, such as the depicted Light Decontamination System – LDS, are highly portable systems making them versatile enough to be used at the scene of any fire e.g. the firefighter could be immediately decontaminated following egress from the incident area, thereby minimizing the occupational exposure to carcinogenic materials and other related hazards.

**To combat this human tragedy a significant amount of research is now being undertaken across the globe to find alternative methodologies which could be used to help reduce the occupational exposure fire-fighters receive during their daily life.**





◀ Top Down Convertibility – Fire Fighting AV300 HT Mask with APR configuration.

Containing no moving parts, these dual fluid nozzle systems have the ability to deliver a wide range of decontaminants making them highly suitable for not only occupational firefighting decontamination applications but other first responder domains such as CBRN and HAZMAT incidents as well. Utilizing compressed air to atomize a liquid, not only are these systems capable of producing large dense clouds of very small droplets (typically 1-10 microns), they are also capable of reaching all non-line-of-sight surfaces. This latter facet makes them perfectly suited for decontaminating complex structures and surfaces such as the ones found in people and equipment.

Effective against both airborne and surface threats, “dual fluid” nozzles typically use 10% of the decontaminant required by existing systems to afford effective decontamination. This is again a vast improvement over the current approach to decontaminating equipment and people which involves ‘total flooding’ using large quantities of active effluent which then requires subsequent treatment and is highly inefficient in terms of cost.

Dual fluid systems, due to the large number of droplets they produce, are also capable of knocking down

short range particulate hazards and the isolation of highly mobile fibers such as asbestos and radioactive materials etc, through the delivery of polymeric coatings. The system can easily be reconfigured for Toxic Industrial Chemical (TIC) and CBRN applications with minimal effort via a simple change in decontaminant. This latter feature further reduces logistical burden and offers a truly comprehensive decontamination capability in a single system. Such system integration, combining the advantages of tailor made and versatile decontaminants, with the versatility of “dual fluid” nozzle based systems will allow the first responder of the future to effect timely decontamination in any global theatre against any threat encountered. Thereby reducing the occupational hazards that first responders such as firefighters will face in the future.

➔ For more information, go to [www.scottssafety.com/emea](http://www.scottssafety.com/emea)



▶ Light Decontamination System.

Images courtesy of Scott Safety

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**Written by Fire Professionals for Fire Professionals**

## Streaming video and firefighting

Firefighting teams have to make immediate decisions informed by years of training and experience. The question is, will live video streaming from the incident enhance effectiveness or impede rapid decisions on the ground? Our experience working with a wide variety of front-line teams, from soldiers to first responders, tells us that adding a carefully considered video streaming solution to their toolkit can provide a tremendous benefit in informing supporting teams and commanders.



**Mark Patrick**

**T**here are multiple opportunities for live video. At Digital Barriers we take a holistic view focusing on all possible providers and consumers of video, as well as the situational awareness that can be derived from them. Providers of video range from fire-service vehicles, temporary video infrastructure placed by firefighting teams, body-worn cameras on firefighters' uniforms, existing local government or law enforcement cameras, and social media

video streams. All are useful but require a cohesive solution in order to gather and disseminate video effectively and avoid information overload. Furthermore, there are significant technical challenges to overcome that should not be trivialised.

The firefighting vehicle fleet attends all manner of incidents and often has a standby role near major events ready to respond as required. Video from the vehicle provides an excellent asset for the command team to use when assessing the environment around the vehicle and any surrounding issues such as overcrowding. This aids general readiness to respond. If an incident does occur, having cameras on the vehicle which are easy to

▼ Digital Barriers demonstrating EdgeVis Wireless Video Streaming Technology at IFSEC 2016.



Mark Patrick is Chief Technology Officer, Digital Barriers.





Image courtesy of Digital Barriers

any large scale incident, the amount of video generated by the public is overwhelming. But it is possible to provide this sort of video to a local command centre quickly and reliably to further assist in incident management.

Steaming video from the field is hard. There are a number of significant constraints, in part generated by the demanding requirements of firefighting teams. The video must be streamed in real-time and not delayed; it must be secure, affordable and reliable – very different from streaming video for a FaceTime chat on an iPhone! It is possible, however, to meet these constraints using a mix of wireless technologies.

The police force was an early adopter of video on vehicles and body-worn cameras, but their use is mostly for evidence collection and to manage liability – i.e. for post-incident analysis and evidence capture. In part, this is because police forces adopted these solutions before it was technologically feasible to reliably stream video in a cost effective manner. Digital Barriers believe that live video is much more useful than just “black box recording” for the emergency services community. So, we have focused our developmental efforts on real-time streaming. The fire-service has a significant need for the additional insight that remote video streaming can provide. It allows ground-teams to concentrate on a hazard, while the centralized incident management team are able to provide a different level of support with the enriched situational awareness available. That said video harvested from an incident also has significant benefits for post incident analysis, to pass to both criminal investigation and training teams.

Streaming over cellular networks is the preferred approach as the infrastructure already exists and is relatively cost effective. However, video is very bandwidth hungry and uses a lot of data. Additionally, during an incident, there may be many members of the public each consuming an element of the local bandwidth by streaming video from mobile phones to social media and contacts. This causes contention for bandwidth and can create delays in the video causing reliability issues. There are many approaches to egress video over cellular. Digital Barriers’ approach is to use our specialist EdgeVis codec (encoding and decoding algorithms)

uniforms give local and remote command teams the ability to view specific activities. They can also determine which additional actions need to be taken and can help teams determine if dangers start to exceed acceptable risk. They also allow firefighters to stream live video to subject matter experts, even if they are very remote, for expert advice on how to deal with an issue. Digital Barriers’ streaming technology has a unique capability that allows incredible detail to be seen over very low bandwidths, even from a remote viewer’s smart-phone. Of course this requires a very comprehensive approach to security, and this general need is further explored below.

In rapidly managing a response to an incident it is often useful to take over local street cameras: general surveillance CCTV that may be controlled by local government or law enforcement. However, the ability to see these cameras is often limited to a centralised incident command, even when it is really needed in the field. There are specialist approaches that allow that video to be harvested and sent real-time to the teams on the ground to allow them to see areas that may be hard to approach on foot. The same is true for video streaming from social media; at

▲ **EdgeVis Live Video Streaming Technology** can be viewed remotely via a Mobile Device.

access by the command team allows them to make additional operational decisions regarding the level of additional support needed and what further emergency services are required – such as more firefighting vehicles, police for crowd control, or ambulances for casualties. Multiple cameras may be placed on the vehicle including one or more “PTZ” cameras; these “pan-tilt-zoom” cameras allow a remote team to zero in on areas of interest to see more detail.

If an incident is underway the firefighting team can rapidly deploy “drop cameras” on tripods as they move to assess the incident area, providing a remote view of blind-spots. Other specialist drop cameras include those carried by drones which may play an increasing role in future incident management. All of these video assets can be viewed locally from the lead engine and from the command team. This allows one central team member to monitor multiple danger areas and assess increased risk of issues such as building collapse.

Body-worn cameras on firefighters’



Image courtesy of Digital Barriers

▲ **EdgeVis Live Full Resolution Retrieval in Action.**

which provides secure and reliable video over ultra-low bandwidths and can therefore cope when networks become constrained. Other techniques we have adopted include creating a local wireless “bubble” at the scene. By using Wi-Fi or mesh radio systems to provide local high-bandwidth communications, control teams are able to view and command teams on the ground via cellular or even satellite communications. Dedicated first responder networks are being revamped across Europe to include higher bandwidth capabilities. Whatever method is adopted, we strongly recommend that the local video systems are kept loosely coupled from communications technology. This will allow either side to upgrade without incurring the cost of a wholesale replacement.

The initial deployment of video streaming can appear to be a big leap for a fire service, but actually there are quite simple ways to engage with these capabilities to fully explore their benefits. Plenty of valuable lessons have been

learned by the law enforcement field, especially by police tactical operations teams. Equipping a fire engine with fixed cameras and a set of drop cameras is a quick exercise, and the infrastructure required to support the system at the command centre can be standalone and control systems. The most important area to address is often security, so the infrastructure must be securely encrypted and access to the system controlled and logged. Use of body-worn cameras requires the most development to ensure that there is no interference with the firefighter’s movements. They also need to be tested to be certain that they can withstand the environments likely to be encountered.

### Key Concepts

There are a number of key concepts that govern the requirements of a video system.

■ **Latency:** How much of a delay there is between the occurrence of an event and it being viewable remotely. In many systems this can be three to ten seconds. This is unacceptable if the centralised incident management

team are to provide effective support. Latency needs to be less than one second to be effective, otherwise known as “real-time”.

■ **Quality:** Video quality is generally measured by resolution and frames per second (fps). The higher each measurement is the more data is used. This increases costs, as well as streaming and storage challenges. Typically we recommend that video is stored at full high definition (1920x1080 pixels – the same as a typical HD television set) and at 12-15 fps. Video streaming is typically lower quality, though our solutions allow the full high resolution detail to be viewed.

■ **Cameras:** The choice of cameras is vast, with normal daylight and low-light cameras, fixed cameras and pan-tilt zoom cameras being the main choices. Thermal cameras are familiar equipment for many firefighters and can also be equipped. One camera type may not suit all applications teams, so they should strongly consider deploying multiple camera types.

➔ **For more information, go to**  
**www.digitalbarriers.com**



# How to Evacuate a Multi-Storey Building

When it comes to evacuating a multi-storey building all companies and organisations, providing services to their employees or the public, need to be prepared for any eventuality. With this in mind, extra precautions need to be taken to accommodate wheelchair users and the mobility impaired ensuring the risk level when evacuating is reduced.



**Mark Roberts**

Mark Roberts is a Director at Evac+Chair International.

**E**vacuation procedures need to be in place along with designated trained staff that will assist in the evacuation process; those employees also need to undergo practical training in the operation of any equipment used in the evacuation. It is now the employers or service provider's responsibility to evacuate people from a building in an emergency; it is no longer the role of the Fire Service to facilitate the safe evacuation of non-domestic premises as outlined in the Regulatory Reform (Fire Safety) Order 2005. It is therefore illegal to plan a fire evacuation that relies solely upon the fire service being involved, potential outside factors such

as traffic delays cannot be predicted and can affect the brigade's response times, the buildings evacuation strategy needs to be self-contained. Employers who neglect proper evacuation measures for employees, visitors or the mobility impaired can be found guilty of failing to provide a duty of care and will face legal proceedings. Health and safety stipulate implementing the necessary certified policies and training in order to comply.

Pre-planning is essential ensuring the needs of all employees, visitors or the mobility impaired are identified and a Personal Emergency Evacuation Plan known as a 'PEEP' or a 'GEEP' General

Emergency Evacuation Plan is devised by the relevant person responsible to comply with Part 2 Section 8 of the Fire Safety Order (RRO).

The PEEP is tailor-made to secure the safety of the named individual(s) in the event of a building evacuation. It will explain the method of evacuation detailing the escape routes and identify those person(s) who will assist carrying out the evacuation and training or practice needs. It will also detail the refuge areas (this is where the mobility impaired can await assistance). The plan should be tested and used during regular evacuation drills to ensure all staff involved are aware of the procedures and receive a copy of the relevant PEEP, a copy of the document should be filed accordingly.

When planning for an emergency in a public access building where mobility impaired or disabled people have total access, a PEEP would not be sufficient. The responsible person would need to devise a General Emergency Evacuation Plan known as a GEEP; the plan will contain the same points that are covered in a PEEP, but needs to be as robust as is practical to accommodate everybody in any potential situation.

The time required to safely evacuate a small building that is not a high rise, wouldn't normally be an issue due to passive fire protection. Therefore high rise buildings can present a number of challenges, the most obvious one being the potential distance needed to take to travel down the stairs to exit the building. These kinds of buildings set themselves apart from others that have a single staircase, due to the time it takes to evacuate and the time required to do so smoothly and effectively. The standard fire protection in a high rise building can range from thirty to sixty minutes allowing the responsible person adequate time to safely evacuate the people under his/her care. In such instances Evacuation Chairs have proved, all over the world, to be the most time efficient and user friendly, enabling the operator and passenger to safely exit the building. Due to the potential number of people that may require assistance, the correct type of equipment and quantity is paramount and is required by law to be implemented. These kinds of products range from Slide Sheets, Slide Pads, Evacuation Chairs or Stretchers. All evacuation aids need to be located in each designated refuge point as specified in the buildings fire strategy. Each fire escape

has to accommodate able bodied people and the mobility impaired; therefore all equipment has to be readily available and easily accessible in each refuge point.

In order to comply, the responsible person should obtain professional advice to establish what is exactly required. This will involve evaluating each floor in order to determine the quantity of each piece of evacuation equipment and the suitability, the reason behind the rationale for each floor being evaluated is to avoid the operators having to make repeat journeys over an excessive distance and re-entering the building, there needs to be sufficient equipment and people willing and trained to operate it.

Evacuated people should never be left to wait for the Fire and Rescue Service unattended in a refuge point. It can be used as an area to wait until it is safe to exit the building or a place of rest. The refuge areas needs to be a safe place and must not have any adverse effect on the means of escape, this can range from a corridor, stairway or an enclosure such as a compartment, somewhere that will provide protection from the fire and smoke and should also be clearly sign posted and kept clear of obstructions, mobility impaired people can remain there until they are assisted to a final exit. Whoever accompanies the mobility impaired person, as identified in the PEEP, needs to report the location of that person to the responsible person in charge of the evacuation. It is essential that all refuge areas have access to an effective communication link to a fixed or mobile staffed area; a person in the refuge area needs to be able to make the necessary communication in an emergency.

The key to ensuring you are prepared for any eventuality is to plan for regular fire drills; these will all depend on the type of building and the occupancy. As a general rule, an evacuation drill should be carried out twice a year; ideally it should be done quarterly. The evacuation needs to be done in accordance with the PEEP or GEEP that was designed specifically for the building, the environment and of course the people. The fire drill will also involve using the relevant equipment installed, the elevators will not be in use and everyone will evacuate to the designated refuge area. The fire drill will be spontaneous and without warning, the only people aware of the fire drill taking place will be the organisers. The responsible person will need to record



▲ Emergency Ski Pad, patient secured in place with straps and dragged to safety.



◀ The standard Evac+Chair 300H model 182kg payload capacity.

the time it takes to make a full evacuation, dependant on the type of building working with your local fire authority will help you to determine a 'safe time'. In the case of a tall building, there is more risk involved due to the distance people have to travel to exit safely, it is therefore essential everyone is aware of the procedure, should there be an increase of people in the building, for example more staff, then the fire drills would need to be more frequent to ensure they are still being carried safely and correctly.

An emergency evacuation can happen at any time without warning, the key to dealing with these situations is to be prepared this is vital, from assessing the building layout to appointing the designated responsible person and of course practising regular fire drills will ultimately save time and more importantly lives in the future.

For more information, go to [www.evac-chair.co.uk](http://www.evac-chair.co.uk)



# Teamwork in rescue – fire, USAR and the right equipment

In the aftermath of events such as a factory explosion, earthquake, or a terrorist bomb, man-made structures are often reduced to rubble piles, sometimes of immense dimensions. For victims trapped deep inside, their rescue depends on the actions of firefighters and USAR teams and the effectiveness of the procedures, equipment and techniques they deploy. If fire is involved, USAR teams often have to wait for the fire services to bring a situation under control before they can move in to start their search and rescue efforts.



**Mikael Westerlund**

**W**hile first responders and medium and heavy USAR teams are typically some of the first on the scene in the aftermath of a disaster, the discipline and procedures they follow and the equipment they employ in their efforts, can mean the difference between life and death for those trapped and still alive beneath the rubble. With such victims potentially conscious or unconscious, possibly able to speak, or totally unable to communicate, getting USAR teams to work as fast as possible

▼ Canine at work in a fire/disaster scenario where fire fighters, USAR and canines come together to succeed.



is of paramount importance. That said, it's only possible for these teams to begin their SAR efforts once any fires have been extinguished, or near extinguished and the rubble pile then made safe by engineers and shoring teams.

It's an unfortunate fact in the case of fires, that it may be many days before firefighters can bring a situation under control sufficiently for others to begin their work, although they will take a lead from fire teams and when absolutely necessary sometimes work alongside them before deploying fully. But when they do go in, it's at this point that the steps and drills USAR teams follow and the equipment they use, can make the difference between life or death for those awaiting rescue. 298

## Inside the SAR toolbox

At the disposal of the USAR team are a specialist set of technical tools used to 'listen' for and locate victims trapped in the rubble pile. These include the latest seismic and acoustic listening devices often used alongside telescopic cameras. These can include heat detecting sensors, but together this toolbox delivers the latest and most effective tech for finding live victims in the voids of a rubble pile once the firefighters have done their job.

Sound vibrations generated by a victim travel through the solid parts of a structure or ground and are picked up by seismic/acoustic sensors, placed on flat surfaces, such as concrete, or wood. They can be pushed into the ground using screw-in spike attachments, or attached to steel structures at any angle or in any plane using magnetic attachments. The operator's display interface provides seismic results in visual form and audio results in the headphones; the system allows the operator to review all feedback enabling him to pinpoint the victim's location. The display panel shows the differing seismic signal strengths coming from each sensor, which appear in a way similar to a graphic equalizer and by seeing which sensor delivers the strongest signal the operator can direct the team to move the other sensors until they home in on the victim's location.

If a victim is alive but unconscious, many seismic systems, however, may miss them as they need to make some kind of noise or movement to be detectable. At the same time, the acoustic detector will pick up sounds such as voices or breathing and can, therefore, detect an unconscious, though breathing victim. Some systems use two acoustic search probes simultaneously giving the operator a stereo comparison of any noises; airborne sound waves have been shown to travel within and under layers of debris in a rubble pile but become attenuated before they escape to the surface. Certain, well known devices in the industry have addressed this by their configuration – attached either to rigid telescopic booms on which they can be pushed into the void, or to flexible cables on which they can be lowered into the rubble. Two-way intercom-based communications between rescuers and trapped victims are also integrated into some leading acoustic sensor systems. 680



Image courtesy of Savox Communications

In mentioning the key USAR tools to be employed during a rescue when fire and USAR teams are working alongside one another, it would not be complete without citing the initial, very basic but proven steps when teams typically begin their search by calling out and listening for any responses or sounds. This will often be followed by the use of specially trained dogs to sniff out and locate victims. The Federal Emergency Disaster Management Agency (FEMA) in the US trains dogs for use in mass-casualty events, for both domestic and overseas disasters. Some canines are trained to discriminate between different kinds of scents and for different scenarios, e.g. rubble, water, forest and avalanche searches, although USAR dogs will alert on any human or cadaver scent and are generally non-scent discriminating.

## When fire and disaster mix – a case study

An explosion on 17 July, 2015 at the Wood Treatment Limited wood mill in Bosley, Cheshire, UK, caused a major fire and the structural collapse of many buildings on the site. The event occurred at around 0900hrs requiring the deployment of some 15 fire appliances and by 1030hrs when fire teams had deployed it was ascertained that two

▲ SearchCam 3000 used in USAR operations. Once located, telescopic search cameras can be used to home in and even communicate with victims.

explosions had taken place, four employees were missing and 35 injured were taken to hospital.

The explosion had been caused by the ignition of wood dust produced in the process to make wood-laminate flooring. Quantities of heating oil, kerosene, acetylene were also present adding to the combustibles and asbestos added to the other dangerous constituents in the mix. This presented dangerous conditions for both the fire fighters and the USAR teams who had to wait on the sidelines until the fires were out before setting about their work. The Cheshire Fire Brigade described as 'fully developed', fires in several areas including a four-storey building that had collapsed among the devastation. The possibility of further explosions meant the fire services had to proceed carefully, with water the main fire-fighting element. 1000

By the evening on day one, the large multi-agency team now gathered, including Merseyside and Lancashire USAR teams, would need to remain for several days before they would be able





Image courtesy of Savox Communications

▲ The Delsar Life Detector showing seismic and acoustic sensors together with the operator's display panel.

to deploy using their Searchcam 3000s and LD3-4 Delsar life detection systems from Savox Communications. Once the fires were under control these devices would be used on many occasions in the days ahead.

Some of the USAR shoring teams worked with the fire services to ensure structures were safe for the firefighters to do their job and gain access to areas where fires were burning in isolated places. At the end of day one the Cheshire Fire Brigade spokesperson was quoted as saying its crews were 'working tirelessly to ensure that search and rescue teams could safely access the site' as soon as possible to search for those missing'.

Specialist USAR teams were only able to begin initial assessments some 24 hours after the disaster struck, with dogs employed at a very early stage thereafter together with the basic search methods outlined above, followed by the first uses, where possible, of the Savox search and rescue cameras and life-detection systems. These two solutions are almost de facto industry solutions in use all over the world.

During the second night, USAR teams discovered a body that in an area that had been identified as of interest by one of the SAR dogs. On day three, demolition and specialist heavy lifting gear cleared a path to the centre of the site for the USAR teams whose efforts continued through the next week alongside the firefighters who continued to douse the site with water. It was at this stage that USAR changed to one of search and recovery and by lunchtime on 21st July a second body was found. On the morning of the 27th July, a fresh USAR team from West Yorkshire arrived on site to replace the crews from Lancashire who, like their Merseyside counterparts, had attended since the start. The Merseyside USAR group remained and continued working with the West Yorkshire team. A full two weeks after the incident began on 31st July the USAR teams were still working 24/7 to locate the missing with firefighters continued to monitor and cool the site. 1381

### Right equipment at the right time

In an event like Bosley Mill, deploying the right SAR equipment at the right time is down largely to the efforts and coordination of the fire department on the scene and whose efforts must ensure the safety of both its own teams and the USAR operatives.

Dogs employed at an early stage are responsible for a many victim-location SAR successes and while no live victims were pulled from the rubble on this occasion the location of deceased workers was aided by the canines. In addition, deployed at Bosley were technical search tools, including Delsar seismic/acoustic life-detection equipment and SearchCam 3000 telescopic cameras, which were used in combination during the SAR phase. Once the recovery phase had begun, however, the SearchCam 3000 alone was employed in the search for the missing.

Recognized in the industry as probably the most powerful such tool available for USAR purposes, Delsar offers full frequency spectrum monitoring that enables an operator to detect everything from the lowest frequency hum, to the highest pitched screech. However, as with all such seismic sensors operating in a wet situation where the fire brigade uses vast amounts of water to drench a fire, water 'dripping' throughout a rubble pile can cause false alerts because it can sound like a person tapping on a hard surface. USAR operators have to use their experience to distinguish between regular water dripping in a post-fire scenario and the tapping of a person, which is often less regular.

### Communicating around the rubble

Operators of technical USAR kit have, until relatively recently, not had a sophisticated means of communicating with other members of the USAR team or fire fighters working alongside them. This made telling everyone to be quiet on detection of a victim, or getting other members of the USAR team to move sensors around the pile, very difficult. A new communications solution – the SR100-Rescue from Savox Communications – is now enabling life detection operators to communicate with other members of the USAR team more effectively who, in turn, can communicate with fire fighters around them over a two-way radio solution that links directly into their other search tools. It also enables the team to communicate directly with command and control elements of a USAR deployment, which has not, previously, been possible.



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# How the development of body armor has helped firefighters

The nature of protective clothing means that there are naturally similarities between different products. For example, there are a number of similarities between bullet proof and stab proof vests, including materials and design. This may seem obvious, but even Turnout Gear shares a number of similarities with bullet proof vests, beyond them both being used to protect an individual. Even their design and development follow similar paths due to the desired end result.



Thomas Bowman

**T**his seems obvious given that both are attempting to protect against a wide range of threats in difficult environments. Nevertheless, the crossover between the two areas is deeper than many realize.

The threats that Firefighters must face from day-to-day will differ greatly from the threats facing others who wear body armor. However, many of the threats are very similar. For example, there are an alarming number of reports of Firefighters being targeted for violence and attacked, sometimes fatally. This is where body

armor may be of use to Firefighters, but even in day-to-day work the development of body armor can and does influence the manufacture of turnout gear.

Of course the main threat that Turnout Gear is designed for is fire; more specifically, heat. Body armor, on the other hand, has to be able to stop bullets, knives, needles, and a variety of other weapons. As we will see, both items have the capability to deal with the threats the other is designed for, albeit far less effectively. The materials used in both bullet proof vests and turnout gear are



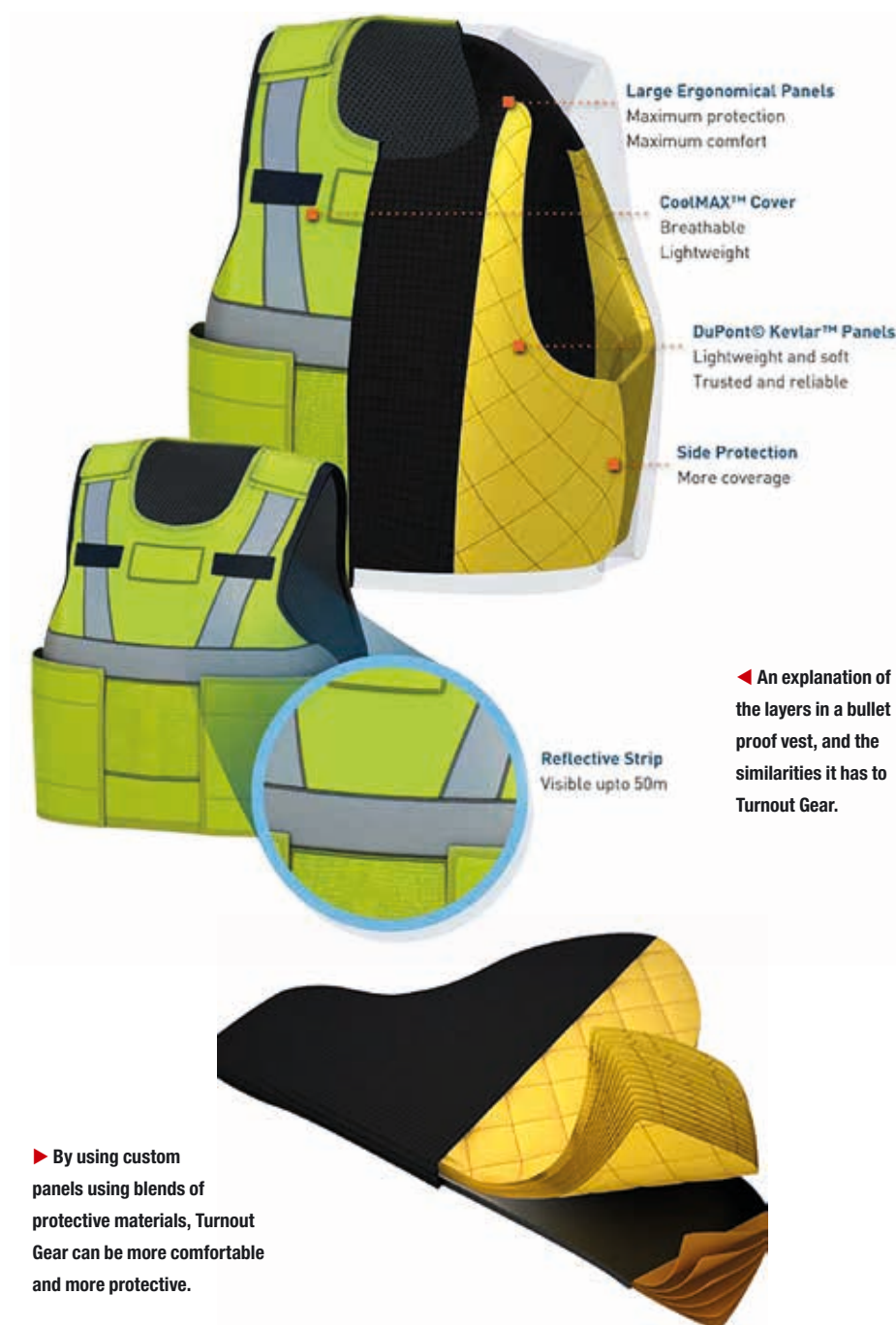
◀ Bullet proof vest manufacturers focus on improving breathability and comfort, which is an aspect of Turnout Gear that needs development.

Thomas Bowman is one of SafeGuard's leading ballistics experts. He spends his time updating partners on the developments within the industry and is instrumental in driving the company's research and development.

largely the same, as both utilize plastic fabrics made of Aramids. These plastic fibers are strong, flexible, lightweight, and heat-resistant, making them ideal to be used for protective clothing of all types. The most common and well-known example of an Aramid fabric is Kevlar, which is synonymous with ballistic protection.

Kevlar is not only incredibly strong, but is lightweight and flexible. This is why it is so heavily favored in body armor manufacture. However, Aramids are also capable of withstanding extreme temperatures, and will not melt or degrade at temperatures of up to 800°F. This means that Kevlar has also found use in Turnout Gear, although Aramid manufacturers often look to provide materials with far higher heat resistance, usually at the expense of some ballistic protection. Nevertheless, Kevlar does find uses in Turnout Gear, offering some protection against impacts and blunt trauma. Some manufacturers offer blends of materials, for example a mixture of Kevlar and Nomex, another aramid material from DuPont that has a far higher resistance to heat. By producing a blend the material can offer the heat resistance needed by Firefighters while also decreasing friction and improving co-operation between the layers of Turnout Gear.

The introduction of materials like Kevlar not only improves protection, but also the overall performance and comfort of the gear. Making protective clothing more comfortable is usually an afterthought, and yet is incredibly important. If nothing else, body armor or Turnout Gear that is not comfortable is less likely to be worn. This is less of a problem for Firefighters, who simply have no choice in wearing their gear, but for Law Enforcement in particular this is a major problem, and many Officers have been killed while not wearing their vest. Improving the comfort of Turnout Gear should still be a high priority for manufacturers, particularly as it will help tackle some of the major problems that can occur in the line of duty. The main problem facing Firefighters is heat, as already noted, but the excessive build-up of moisture that it causes is just as serious. Excessive sweating alone can cause severe physical issues, such as exhaustion and cardiac arrest,



▶ By using custom panels using blends of protective materials, Turnout Gear can be more comfortable and more protective.

but any build-up can also lead to very severe burns if the moisture is heated. Furthermore, if the air barrier in the Gear is compromised by the moisture, it can seriously degrade the protection it offers.

This is an important area of interest, and one in which body armor manufacturers can help improve Turnout Gear. There has been an increased focus in the body armor industry on improving the comfort of vests to help ensure it is worn. This has led to the development of new, thinner materials that allow for a thinner vest at the same protection, research into ergonomic design, and most importantly the inclusion of temperature-regulating materials. By

including these materials a vest can actively reduce the temperature of the wearer by drawing moisture away from the body, which would prove to be very useful for Firefighters. Furthermore, the combination of these breathable materials with fabrics like Kevlar allows for a better barrier to heat, whilst at the same time removing excess heat from the layers closest to the skin. This means that the layers of Turnout Gear could work together more efficiently, creating a far more comfortable and protective piece of equipment.

➡ For more information, go to [www.safeguardarmor.com](http://www.safeguardarmor.com)



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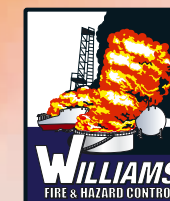
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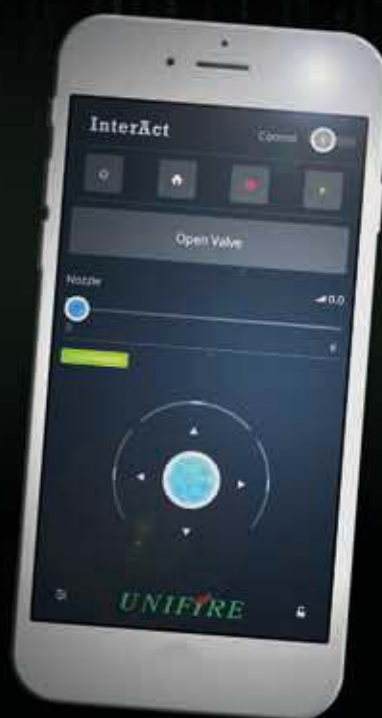
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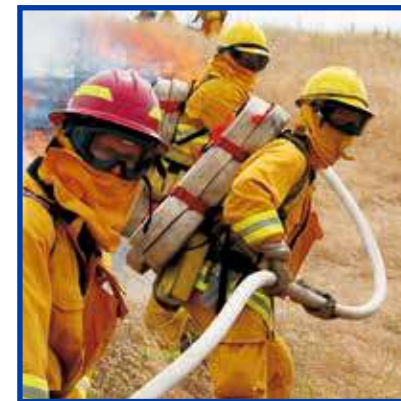
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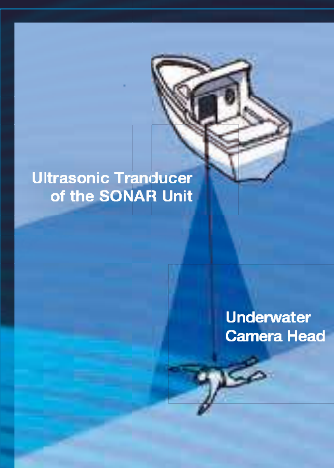
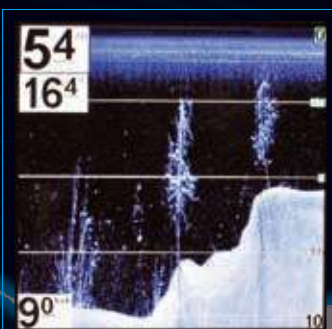
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SONER Display image



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Cover image: The Future Begins Now. Web-based and fully automatic fire fighting robotic nozzles are here. Image courtesy of Unifire.

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# Health and safety are critical to firefighter success



**Kevin D. Quinn**

Chair of the National  
Volunteer Fire Council



**T**oo often firefighters and emergency medical responders subscribe to the belief that they need to put others first at the expense of their own health and safety. To some extent this is true – we are the ones running into the disaster when others are running out. But what happens if we are not able to serve at our best level? How does this affect those we are trying to protect and our crew members who are counting on us?

In the fire service, the health and safety of one has a direct impact on the wellbeing of many. If an emergency responder has a heart attack on the scene, or is taken out of commission due to cancer, or flips a vehicle because of reckless driving, the entire crew is affected by the consequences. In this way, our individual choices when it comes to health and safety are directly linked to the overall success of the mission and the safety of our crew.

One of the priorities of the National Volunteer Fire Council is for all personnel

to serve strong. By this we mean that each individual firefighter, emergency medical provider, or rescue worker should be at their best when performing their duties. Being personally responsible for our health and safety is a critical part of our job. A commitment to health goes hand in hand with our commitment to service.

Some key health and safety issues we are focusing on are as follows:

### Heart Health

Studies have shown that emergency responders are at greater risk for heart attack. In the U.S., heart attack accounts for about half of all on-duty firefighter deaths each year. Adding to the problem is that many firefighters have poor sleep habits, aren't physically prepared for the job, and eat an unhealthy diet. Functional fitness, good nutrition, weight management, and controlling risk factors such as high blood pressure and cholesterol are all important components of being a heart-healthy firefighter.

### Cancer

Research has found that firefighters contract cancer at higher rates than the general population. Toxic chemicals are released during fires and other emergencies, which can then be absorbed, ingested, or inhaled into a firefighter's body. There are many steps firefighters can take to help protect themselves. These include wearing full personal protective equipment and breathing apparatus until the fire is cold and there is no smoke and steam; washing your hands after responding and before touching any food; using a cleansing cloth to wipe your face and neck after a fire response and taking a hot shower as soon as possible; decontaminating your personal protective equipment at the fire scene with a hose line and rinsing off your helmet liner and gloves after each use; and washing your gear and hood after each working fire.

### Behavioral Health

Mental health is just as important as physical health. Firefighters and rescue personnel regularly experience traumatic situations as part of their job, and this can have a significant impact on their wellbeing. Post traumatic stress disorder, depression, addiction, anxiety, and other mental health concerns are common among emergency responders. If left unaddressed, these issues can have devastating impacts on a person's ability to perform as a responder, on their personal relationships, and on their overall wellbeing. Suicide is a growing concern in the emergency services. The Firefighter Behavioral Health Alliance has received reports of 226 firefighter and EMT suicides in the U.S. between January 1, 2015 and October 3, 2016. Removing the stigma surrounding behavioral health and creating a department culture where people can reach out and receive help if needed is critical.

### Vehicle Safety

Vehicle crashes and struck-by incidents result in emergency responder deaths and injuries every year. Having and enforcing standard operating procedures for safe vehicle operations and traffic incident management can help reduce these threats to responders.

While this is not a comprehensive list of the health and safety challenges emergency personnel face, it does illustrate that our jobs present unique challenges to our health and safety. We need to proactively take care of ourselves as well support each other in these efforts. It is in this way that we can serve strong. After all, a better you equals a better crew.



For more information, go to  
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## National Fallen Firefighters Foundation welcomes FLIR Systems as a Gold Sponsor

The National Fallen Firefighters Foundation (NFFF) is proud to welcome FLIR Systems, Inc., the world leader in thermal imaging, as a Gold Sponsor. The NFFF will direct proceeds from FLIR's sponsorship to fund programs that honor the fallen, assist their survivors and aid in the prevention of future line-of-duty deaths and injuries by delivering more thermal imaging cameras (TICs) to more firefighters on the line.



Image courtesy of FLIR Systems

FLIR designs and develops a variety of thermal imaging cameras for firefighters, including handhelds, ladder mounted cameras, and aerial drone kits that allow firefighters to gain a perspective from multiple angles. With the ability to see in complete darkness and see through smoke, to identify hot spots, to navigate safely, or to remain oriented during response missions and locate and rescue victims easily, FLIR provides a thermal solution to help improve awareness and safety of firefighters.

The United States Congress created the NFFF to lead a nationwide effort to remember America's fallen firefighters. Since 1992, the non-profit foundation has developed and expanded programs to honor fallen fire heroes and assist their families and coworkers. The NFFF also works closely with the fire service to help prevent and reduce line-of-duty deaths and injuries.

"We are very pleased to have this new partnership with FLIR and appreciate their support of the National Fallen Firefighters Foundation's efforts to keep firefighters safe and reduce line-of-duty deaths," explained Chief Ron Siarnicki, Executive Director of the NFFF.



"FLIR's mission is to outfit every firefighter with a thermal imaging camera," said Richard Wexler, marketing director of FLIR Instruments. "Our partnership with the NFFF will allow us to make progress in this mission by equipping more firefighters with thermal imaging cameras, helping them work safer and save more lives. We're honored by this partnership and look forward to working together with the NFFF to make a difference within the firefighting community."

For more information, go to [www.firehero.org](http://www.firehero.org)

## Dr. Sthamer and H2K set to deliver second Foam School

Following the success of their first foam school held in France in April, 2016 Dr. Sthamer and H2K are looking forward to their second foam school being just as successful.

The first event took place at the CNPP training centre in Vernon, a former refinery site which has been transformed into a well equipped centre for realistic hands on training. The centre has various props which create credible industrial incidents,

including storage tank and tank bund fires. The foam school attracted twenty delegates from six different countries with training being a blend of theory including tactics and strategy, workshops, demonstrations, new developments and practical training.

The second foam school is taking place from 27th – 31st March 2017 and will again be returning to the CNPP Training Centre in Vernon, France.



Image courtesy of Peter De Roos

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## Capita and West Midlands Fire Service launch 999EYE

An innovative solution has been launched that enables emergency control rooms to be at the heart of unfolding incidents by viewing live footage streamed from eye witnesses at the scene. Launched by Capita in collaboration with West Midlands Fire Service, 999EYE is the first-ever smartphone solution that enables 999 callers, with compatible mobile devices, to securely send live footage or images of incidents to emergency service control rooms.

It works by sending, with the 999 caller's permission, a text message to their smartphone containing a URL. Once clicked, a one-use-only live stream is established that allows footage or images to be sent directly to the control room. GPS coordinates are also delivered, helping to pinpoint the exact location of an incident.



Image courtesy of Capita

The solution enables control staff to quickly establish the severity of an incident and then ensure that response crews have been safely and efficiently despatched to locations with the information they need. The service will be piloted by West Midlands Fire Service, which will be the first emergency service to go live with the solution.

Area Commander Steve Taylor of West Midlands Fire Service said: "Our fire crews currently take an average of just 4 minutes and 40 seconds to reach emergencies in which people or buildings are in danger. Responding to incidents safely, quickly and assertively is key to reducing casualties and damage to property.

"We're proud to be at the technological forefront with 999EYE. It will help to ensure that people get the most appropriate response, complementing the skills of our expert control staff in obtaining information from 999 callers."

Chris Jones, CEO, PageOne, Capita, said: "Conceived by West Midlands Fire Service and jointly developed with Capita, this is a ground breaking solution that has the potential to deliver significant benefits to blue light services and the general public. In addition to fire and rescue services, this technology could advance the way 999 calls are reported and dealt with by the Police, Ambulance services, the Maritime and Coastguard Agency and Mountain Rescue services across the UK."

 For more information, go to [www.capita.com](http://www.capita.com)

## Lake Assault Boats assist with emergency

Lake Assault Boats recently assisted the Superior, Wisconsin Fire Department in its response to a fire on an ore boat at Fraser Shipyards. At the time, a team from Lake Assault was in the final stages of testing the 28-foot fireboat destined for the City of Newburgh, NY. After its successful assist – by providing a water supply for the Superior FD – the craft was placed into service with the City of Newburgh Fire Department in Newburgh, NY.

"Before shipping to customers, we carefully test and inspect every fire boat; this was the first time, though, that we've ever responded to a live fire with a craft during its final preparations for delivery," explained Chad DuMars, Lake Assault Boats vice president of operations. "We are very proud that the boat performed flawlessly with Superior FD, and are, of course, very happy that it's now on duty with the City of Newburgh Fire Department, protecting vital portions of the Hudson River."

The fireboat protects large waterfront sections of the Hudson River north of New York City. "It's pretty interesting that our Lake Assault fireboat helped put out a fire before it was even delivered," said Ed Petricek, Assistant Fire Chief with the City of Newburgh Fire Department, a 17-year veteran of the department and a member of the committee that spec'd the boat. "We

first learned about Lake Assault at the New York Chiefs Show some years ago and, once we were awarded a FEMA port securities grant, we didn't waste any time moving forward. Our firefighters are really excited to have this new Lake Assault fireboat; it has improved our on-the-water response capability, big time."

The 28-foot fire boat is a landing craft style hull configuration that features a hydraulically operated bow door, a fully-enclosed CBRNE-rated pilot house (with HEPA filtration and positive pressure system), and twin Honda 250-hp outboard motors. The craft also sports a 2,000 gpm Darley fire pump, foam capabilities, and built-in hose storage compartments. The boat is equipped with a full array of electronics, including Garmin GPS, sonar, and a forward-looking infrared system (FLIR).

In a joint initiative, the City of Newburgh Fire Department also uses the boat to support the city's police department. "If the police department needs to go on the water, we take them out on the Lake Assault craft," added Chief Petricek. "We equipped the boat with a police radio and other law enforcement equipment, enabling our city to efficiently consolidate its water response using the Lake Assault unit."


 For more information, go to [www.lakeassault.com](http://www.lakeassault.com)



Image courtesy of Lake Assault Boats



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## Scott Sight wins prestigious award

Scott Safety continues to receive top industry and innovation honors with recognition by Frost & Sullivan for superior leadership, technological innovation, customer service, and strategic product development. The April 2016 launch of Scott Sight, the first in-mask, hands-free thermal imaging camera, has earned Scott Safety Frost & Sullivan's 2016 Competitive Strategy Innovation and Leadership Award.

"Scott Sight's situational awareness capabilities go well beyond other competing products," said Frost & Sullivan Analyst Sanjana Prabhakar. "The company has successfully set the stage for future innovation in a market that has been historically underserved."

Scott Sight provides visibility in smoke-filled environments, reducing the chance that hazards such as hot spots are missed, decreasing the time it

takes to locate and rescue victims, and assisting firefighters in finding an escape route, all while leaving their hands free for other critical tasks. Firefighters are armed with situational intelligence to perceive the threat, understand the danger, and calculate their reaction.

Scott Safety's Firefighter of the Future initiative, an internal "lean startup" team launched in 2014, was tasked with developing innovative, lifesaving solutions for firefighters. Working out of a technology "garage" hub, the team developed Scott Sight to provide always-on, always-available, and hands-free visibility to every firefighter.

Frost & Sullivan also recognized Scott Safety's efforts to make this lifesaving technology affordable. "We knew developing the technology wasn't enough and that it also had to be affordable for an industry that is consistently facing



Image courtesy of Scott Safety

budget constraints," said Kim Henry, Scott Safety's director of growth initiatives and lifesaving products.

Scott Safety will be presented the award at the Frost & Sullivan gala to be held Jan. 11, 2017, in San Diego.

Scott Sight was also recently awarded the 2016 Best of What's New award from Popular Science.

For more information, go to [www.ScottSight.com](http://www.ScottSight.com)

## Ziegler Group delivers for Disneyland Resort Shanghai

The Ziegler Group recently delivered a RW to the Disneyland Resort Shanghai. The vehicle was manufactured at the Ziegler facility in Croatia.

The RW is built on a Mercedes Benz ACTROS chassis and with a high-performed V-6 diesel engine. The establishment in proven ALPAS® construction guarantees highest stability, optimal corrosion protection and maximum strength.

The Vehicle has an engine output of 320 HP and has a maximum permissible weight of 20.000 kg. The Ziegler crew cab is designed for a crew 1+1+8. The RW is equipped with a Rotzler winch TR 030/6, a Palfinger Loading Crane PK 10.000 and a Fireco Light mast. Furthermore the vehicle is equipped with a 23 kVA generator.

Zeigler's customers are faced with diverse, partly very complex requirements.

To give a maximum security, Ziegler provides products of the highest quality. This affects not only this vehicle, but is also reflected in all components. These details, whether large or small, make Ziegler products not only a vehicle or

component, but also a user-friendly, comfortable and efficient partner for Ziegler customers.

For more information, go to [www.ziegler.de](http://www.ziegler.de)



Image courtesy of the Ziegler Group

## Polish vehicles protect power plants in Slovakia

Polish company WISS have manufactured and delivered 7 new special purpose vehicles to Slovakian Petroservis. The vehicles are protecting buildings, personnel and special facilities at the two nuclear power plants. In total the company, from Bielsko-Biala have delivered over 550 vehicles to Slovakia.

As per the contract 4 new vehicles were delivered to the power plant in Mechovce and 3 others to Jaslovskie Bohunice.

All vehicles are built on Scania chassis and equipped with modern fire and rescue equipment. The first of the ordered vehicles are based on the Scania P320 4x2 drive and has a double cab in the 2 + 4 configuration. They are equipped with a water tank with a capacity of 3,000 litres, the Ruberg R40 pump generates high-pressure and a JMWGT 3200 monitor for deploying the extinguishing agents.

Scania P450 chassis and 8x4 drive were used for the production of a further two vehicles. The first model is fitted with a 6,000 litre water tank, a 1,000 litre foam tank and 1600kg of CO2. The vehicle is also fitted with a Ruberg Euroline pump and a branch fitted with an electric reel. The second model is equipped with a water tank with a capacity of 8,000 litres and foam tank 1,000 litres and 1000kg of CO2. The rescue team will also use the Ruberg Euroline dual-band pump and the branch with an electric reel.

This is not the first contract signed with our southern neighbors. Last year, the company WISS - Wawrzaszek Inzynieria Samochodów Specjalnych (Special Vehicles Engineering), completed delivery of 550 special vehicles for Slovak firefighters. It was the largest single order in the company's history.

WISS distributes its vehicles to Estonia, Bulgaria, Morocco, Romania, Germany and Slovakia – 46 countries In total all over the world.

For more information, go to [www.wiss.com.pl](http://www.wiss.com.pl)



Image courtesy of the WISS

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# Armadillo Merino

## The most effective base layer system for optimal wearer performance

**F**irst responders experience many stresses, strains and challenges when performing front line duties whilst wearing PPE.

PPE is an essential component of front line clothing and is designed to save lives and reduce injuries. Extensive research has been conducted looking at the outer protective layers but little research has been undertaken to determine the effectiveness of next-to-skin clothing as part of a layered system.

The 2012 Ontario Firefighter PPE Survey recommended; "An emergency responder's next-to-skin, base layer clothing must optimize the necessary thermal protection during live fires but also enhance thermoregulation during recovery and non-fire related calls to reduce cumulative physiological strain, while maintaining perceptual clothing comfort."

▼ **Ottis Buzzard, Okanogan Fire District, WA wears Armadillo Merino®.**



### Research – next generation base layers for firefighters

In 2013 Guelph-Humber University in Canada researched four different baselayers during live-fire evolutions to identify the next generation of baselayer systems for fire-fighters. Four different garments systems were tested and compared with live physiological monitoring and perceptual/sensorial measurement.

The research findings ranked Armadillo Merino® as the number one choice of next-to-skin clothing with 67% selecting Armadillo as their first choice and 100% as their first or second choice.

### Why Armadillo Merino?

Armadillo Merino design and manufacture the most advanced next-to-skin clothing system in the world. Armadillo Merino baselayer garments greatly enhance the safety, performance, health and comfort of wearers operating in extreme conditions.

Armadillo Merino fabrics don't melt or drip and provide a natural flame resistance up to 600C. Armadillo fabrics have many inherent fabric properties including no electrostatic build-up, high UVA & UVB protection with a remarkable ability to thermo-regulate under both hot and cold conditions. Sweat is actively managed in vapour and liquids state keeping users comfortable while limiting any odour build-up and maintaining a more stable core body temperature.

Armadillo Merino was chosen to supply a head-to-toe clothing system for the Buckinghamshire & Milton Keynes Fire and Rescue Service (BFRS) in the UK. BFRS were looking for base layer garments which had fewer limitations and challenges than cotton or synthetic materials and wanted a T-shirt style top that could be worn at all times when on duty, without the need to issue alternatives.

The work of the BFRS technical rescue staff required base layer clothing that could be adapted to meet the



▲ Armadillo Merino® providing head to toe, next-to-skin protection.

physiological demands of challenging environments and differing weather conditions. The team is part of the national urban search and rescue capability, meaning they can be deployed to incidents anywhere in the UK for extended periods of time.

The trials found the Armadillo Merino garments offered a higher level of flame resistance than existing next-to-skin clothing. Mark Jones, former Chief Fire Officer at BMKFRS said: "The outcome of these trials was crucial in the purchase decision. After a series of extensive and punishing wearer trials, the Armadillo Merino garments outperformed the cotton and synthetic alternatives, providing a good solution on the grounds of effectiveness and wearer comfort.

"Whilst there are less expensive garments available and money is always tight in this service, we felt that we needed a greater focus on improving base layer clothing in addition to outerwear PPE. This represents a significant investment to improve the health, safety and welfare of our specialist staff that fits well with our ethos of seeking high quality to achieve the best value over time."

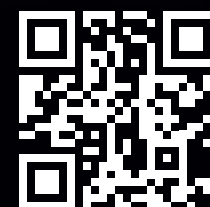
For more information, go to [www.armadillomerino.com](http://www.armadillomerino.com)



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# PHOS-CHEK from ICL-AA

## New firefighting foam for the US Air Force



**T**he US Air Force has awarded a \$6.2 million contract to replace firefighting foam used in fire vehicles with an environmentally responsible foam to reduce the risk of possible contamination of soil and groundwater.

ICL Performance Products was awarded the contract Aug. 15 for 418,000 gallons of Phos-Chek 3%, six carbon

▼ ICL has delivered 418,000 gallons TO more than 170 different locations worldwide.

chain aqueous film forming foam (AFFF). The Air Force expects delivery to begin in August and for all foam in fire vehicles and fire stations to be replaced by the end of 2016.

"AFFF is used by civilian and military firefighters to extinguish fires in aircraft accidents and other emergencies where jet fuel and other petroleum-based flammable materials are present," said James Podolske Jr., the Air Force fire chief. "The Phos-Chek foam will replace the current product in use in Air Force fire vehicles."

The Air Force is replacing the foam to reduce the potential risk of

contamination from perfluorinated compounds in AFFF. These compounds, commonly called PFCs, are found in many commercial products.

The Environmental Protection Agency has classified PFCs as "contaminants of concern," and set health advisory levels for drinking water supplies in May. Two specific compounds are the focus of regulatory interest: perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS).

Podolske said Phos-Chek was developed under the EPA's PFC Stewardship Program. The foam is PFOS free, and contains little or no PFOA.

► 55 gallons drums stored awaiting shipping at Auxquimia's Facility in Spain.



"The Air Force must continue to use AFFF in its defense operations to protect people, critical weapon systems and infrastructure, but we will do so in a more environmentally responsible way that also makes our operations safer for the public," Podolske said.

The Air Force also recently awarded a contract to retrofit all aircraft rescue and firefighting vehicles with specialized equipment that will let firefighters conduct fire vehicle operational checks and required annual foam tests without discharging any AFFF into the environment. Retrofitting the Air Force's fleet of more than 800 vehicles will take about 15 months, Podolske said.

The Air Force has restricted AFFF use for emergencies only. When AFFF is used, Air Force hazardous materials teams will treat the response scene as a hazardous site, and remove and destroy foam residue before contamination can occur.

The Air Force is considering several courses of action to address the AFFF used in aircraft hangar fire suppression systems. Unlike mobile fire trucks, the AFFF in hangars is contained to a stationary location, which is a more stable and controlled environment, Podolske said.

Replacing the foam is part of the Air Force's aggressive efforts to ensure PFCs are not a threat to human health and the environment, said Mark Correll, the deputy assistant secretary of the Air Force for environment, safety and infrastructure.



Images courtesy of ICL Group

► For more information, go to [www.auxquimia.com](http://www.auxquimia.com) or [www.phoschek.com](http://www.phoschek.com)

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# SUPERPASS® 5X

## NEXT GENERATION DSU ALARM

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- NFPA Compliant - NFPA exceeds all other standards
- Certified Intrinsically Safe
- Field Upgradable to RF DSU/PASS Alarm for use with In-Command® First-In and Full Crew Systems



Actual Size

## Grace Industries Inc. NFPA Compliant SuperPASS®5, SuperPASS®5X, and TPASS®5

**G**race Industries Inc. is pleased to announce the new “one of a kind” NFPA compliant firefighter Stand-Alone Personal Alert Safety System (PASS) and RF PASS. The National Fire Protection Association (NFPA) is responsible for establishing safety standards for the fire industry including fire department personal protective equipment (PPE) in the United States. All firefighters in the United States are required to use NFPA compliant PASS alarms. The term PASS alarm is known globally as a Distress Signal Unit (DSU).

NFPA1982 is an equipment design standard which defines the design criteria of the PASS/DSU alarm; and NFPA1500 is an operational standard which defines how the PASS is to be used on the fire ground and in other hazardous environments. A PASS/DSU

must first be NFPA1982 compliant before it can be NFPA1500 compliant.

The NFPA1982-2008 Edition has been replaced with a higher design standard of NFPA1982-2013 Edition. In order to earn NFPA1982-2013 Edition compliance, manufacturers’ have been challenged to design and produce PASS alarms to a higher standard design requirement, along with new, more stringent, testing criteria.

Grace Industries is the only manufacturer who meets the demands of the current NFPA1982-2013 standard with the one-of-a-kind stand-alone SuperPASS® 5, SuperPASS® 5X and TPASS®5 PASS/DSU alarms. Because it is a stand-alone PASS/DSU, and does not require an SCBA to operate, it can be moved from one piece of protective clothing to another. The stand-alone feature of the PASS/DSU keeps firefighters within NFPA1500 compliance for use of PASS alarms at all times and within all hazardous environments;

even those environments that do not necessitate use of an SCBA.

A problem within the fire industry exists for firefighters who remove their Self-Contained-Breathing-Apparatus (SCBA) and then continue to work on the fire ground during fire overhaul and other operations. Most firefighters today are using PASS/DSU and RF PASS systems which are integrated into the SCBA, and require the firefighter to wear the SCBA to use the PASS/DSU system. When the firefighter removes the SCBA, and continues to work on the fire ground, it places them in danger and out of compliance with NFPA standards.

Grace has solved this problem for the firefighter with their new “one-of-a-kind” standalone fifth generation SuperPASS®5, SuperPASS®5X and TPASS®5 (NFPA compliant standalone PASS and RF PASS). The Grace stand-alone PASS and RF PASS are not integrated into any SCBA and do not rely on a firefighter having to wear the

▼ NFPA Stand-Alone Audio  
DSU/PASS and RF DSU/PASS.





SCBA to stay protected. Grace is the only manufacturer with a stand-alone NFPA compliant PASS and RF PASS that protects every firefighter regardless of whether an SCBA is worn.

A major contributing factor leading to fire ground injuries has been congested radio voice channels. High levels of voice radio traffic lead to chaos and confusion, putting firefighters at risk of not hearing critical messages such as the evacuation command or call for PAR; this is a second problem solved by NFPA Compliant Grace RF PASS and In-Command® accountability systems. The wireless Personnel Accountability Report (PAR) check is a function of the accountability system that significantly reduces radio voice traffic on the fire ground while keeping the Incident Commander “in the know” with a full report of acknowledgements from their crew.

Grace has developed the “one of a kind” stand-alone firefighter SuperPASS®5X functioning as a traditional audio PASS alarm that when field upgraded becomes an RF PASS with all of the performance and features of a TPASS®5 for use with Grace In-Command® accountability systems. The SuperPASS®5X is the first device to provide a field upgradable migration path for budget conscious departments and a “ladder up” into Grace Fire Fighter In-Command® Emergency Signaling and Automated Accountability Systems.

The 2013 NFPA Compliant TPASS®5 improves upon the prior-gen TPASS®4 and features a smaller, lighter and louder RF PASS with a new internal antenna design. The TPASS®5 and upgraded SuperPASS®5X are backward compatible with Grace’s Firefighter Accountability Systems including In-Command® upgraded with First-In and In-Command® Full Crew. These systems are designed to fit the operational structure of all departments regardless of size. Grace SuperPASS®5 and TPASS®5 systems are stand-alone, do not require integration with SCBA breathing apparatus, and satisfy NFPA requirements to protect all fire ground personnel inside or outside of the hot zone.

Many firefighter accountability systems in use today are manually-operated and complex, requiring dedicated personnel to manage and do not protect all firefighters on the fire ground. Because these



▼ NFPA In-Command® First-In  
Emergency Signaling and Automated  
Accountability System.

systems rely on a PASS that is integrated within the SCBA, these systems leave the remaining fire ground personnel outside of the hot zone unprotected. Grace’s In-Command® First-In and In-Command® Full Crew Emergency Signaling Accountability Systems are the fire industry’s only NFPA compliant accountability systems that will support stand-alone RF PASS and protect firefighters when they remove their SCBA.

The Grace In-Command® First-In Emergency Signaling Accountability System does not require integration with breathing apparatus and is designed to support all members including personnel of a smaller department’s “first-in” crew who do not always have the time or personnel to set-up a full accountability system.

When used with the In-Command® First-In Tablet Application, the In-Command® First-In Emergency Signaling Accountability System is an NFPA compliant accountability system. First-In Tablet is simple to use and quick to deploy. The heart of the system is the Wi-Fi enabled Incident Alarm Monitor used to communicate with the In-Command® First-In Tablet App for Android. The Incident Alarm Monitor also is used to alert fire ground personnel with an extremely loud siren, strobe light and provides an EVAC push-button to send an RF Evacuation signal to TPASS®5/5X.

In-Command® Full Crew is a second NFPA compliant PC based Emergency Signaling and Automated Accountability System designed with all of the features of In-Command® First-In and with advanced features that fit the operational structure of larger departments. In-Command® Full Crew provides mutual-aid accountability

and monitoring using Windows 7 version software designed for use on laptops and Windows tablets.

Grace Industries’ President Bob Campman states, “The SuperPASS®5X and TPASS®5 solve two common fire ground problems. First, one created by high traffic on radio voice channels. Radio voice PAR check traffic creates congestion that competes with fire ground voice radio traffic. Our proprietary and patented Automated PAR check replaces the traditional manual PAR check performed on the radio voice channel. The Automated PAR check is now part of our affordable, Automated RF PASS Accountability System, designed to fit the operational needs of both large and small fire departments. Secondly, a standalone PASS or RF PASS solves the problem of limited protection given to only those fire fighters inside the hot zone with SCBA integrated PASS. As required by NFPA1500, now all fire personnel, both inside and outside the hot zone are protected by wearing a standalone SuperPASS®5, SuperPASS®5X, or TPASS®5 that does not require the use of SCBA.”

Since 1974, with close to a million PASS alarms sold, Grace Industries continues to be known as a pioneer in the development and manufacture of standalone firefighter PASS, as well as, a developer of “Solutions for Life Safety” within Industrial, Mining and Transportation markets in more than 31 countries. Grace offers a diverse suite of wireless RF Lone Worker personal safety products, as well as, visual alerting and audio alarm safety products.

▼ For more information, go to  
[www.gracefirefighter.com](http://www.gracefirefighter.com)

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# Unifire

## Swedish solution for high-rise building fires

**S**wedish fire fighting nozzle specialists, Unifire AB, have developed what may very well usher in a new era in fire fighting: a fully automatic fire detection and extinguishing system, called FlameRanger™. The system, according to Unifire, is capable of detecting and extinguishing a fire in seconds of its breaking out, with minimal use of water, and without any human intervention required.

Unifire has specifically designed a special version of the system, called FlameRanger XT™, to protect the exteriors of high-rise buildings that are at a particularly high-risk of fire due to the material used in the exterior panels – a continuing problem that has been linked to a number of devastating high-rise exterior fires in the UAE and elsewhere.

### The problem solved

Unifire spokesman, Roger Barrett James, explains that, “Fire grows exponentially – all fires start out small, but then grow extremely quickly as long as they have oxygen and a fuel source. If you can both

▼ **InterAct enables any device with authorization to monitor and control the FlameRanger system.**



detect a fire and begin extinguishing it right away with a high volume of water, directly at its source, then you not only maximize your chances of successfully extinguishing it, but you also minimize damage and use the least amount of water or agent necessary to extinguish the fire.”

The FlameRanger was designed specifically to achieve both of these goals – fast detection, and fast suppression. Full-scale tests of the system have proven the technology to be astonishingly effective, and Unifire indicates that the system is now available on the market, ready to be installed on high-risk buildings and in a wide-range of other applications, including the protection of oil & gas facilities, aircraft hangars, tunnels, warehouses, stadiums, factories, and other large-volume spaces, both on- and off-shore.

### How it works

The system works by combining advanced Tyco FlameVision FV300 IR array flame detectors with Unifire's highly advanced, Force™ high-flow, stainless steel 316L robotic nozzles (a new generation of remote control fire monitors), which feature industrial-robot-type brushless (BLDC) motors, providing extreme accuracy and long life.

When a fire breaks out, it is detected in seconds by the flame detectors, which feed the fire's coordinates to the system's advanced electronics, called the TARGA™ PLC. By combining the two dimensional position data from two separate flame detectors, the system's software is able to triangulate the size and position of the fire in three-dimensions. With this information, the system then aims the robotic nozzle at the fire, and opens a valve to turn on the water and begins extinguishing the fire with a high volume of water or foam, with pinpoint accuracy. According to Unifire, the entire process of detecting a fire, triangulating its 3D size and location, aiming the robotic nozzle, opening the valve and commencing suppression, typically takes only 5-15 seconds.

The system continuously updates the fire's position 10 times a second, fighting the fire dynamically, in real time, eerily similar to the way a human firefighter would.

As soon as fire is no longer detected, the system signals the valve to close, stopping the flow of water. The system continues detecting for the presence of fire, however, and will recommence suppression should any fire break out again.

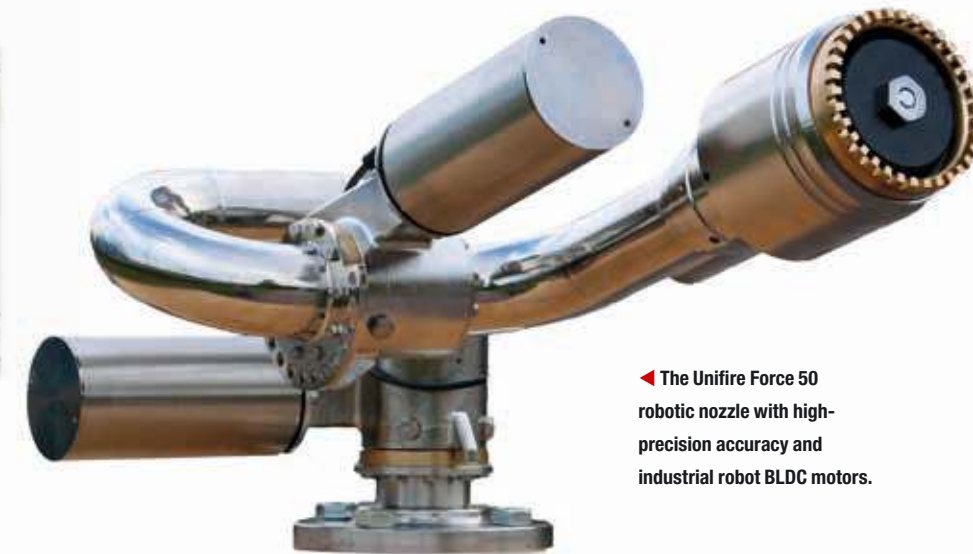
By accurately directing a high-volume of water onto the fire so quickly after it has ignited, the system has in full-scale fire tests proven capable of fully extinguishing fires in 20 seconds or less from ignition.

Importantly, the FlameRanger has an extremely low risk of false alarms. Each of the FV300 flame detectors used in the system employs highly advanced algorithms to detect flame, and thus have an extremely low risk of false alarms. Moreover, the FlameRanger system will not react unless two detectors both independently detect a fire, at the same time and at the same location – making the chances of a false alarm negligible, according to Unifire.

In essence, the FlameRanger is very much like having a firefighter on duty 24/7/365 – it reacts immediately and fights fire very much like a human firefighter.



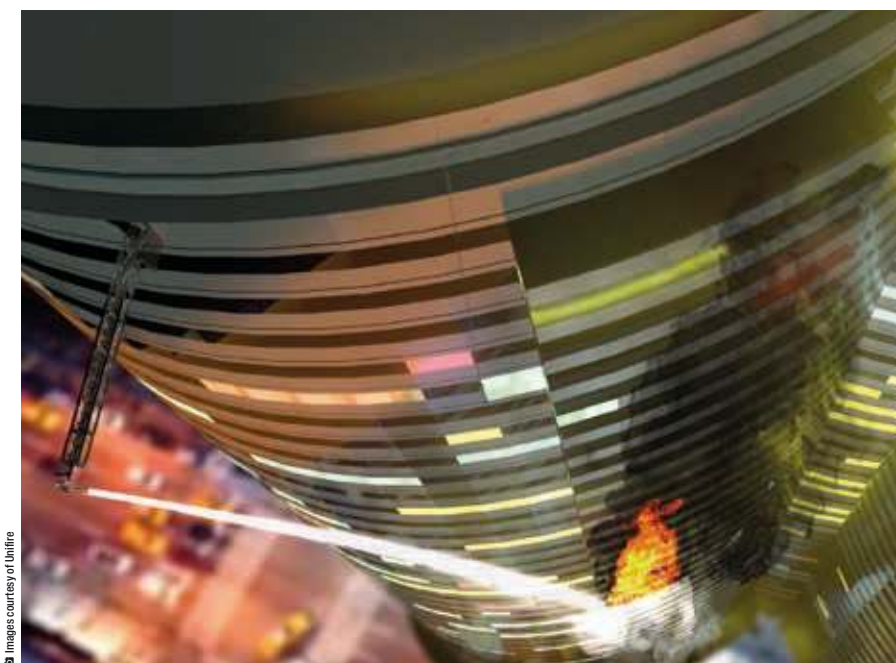
▲ **InterAct enables any device with authorization to monitor and control the FlameRanger system.**



◀ **The Unifire Force 50 robotic nozzle with high-precision accuracy and industrial robot BLDC motors.**

According to Mr James, “In fact, one of the tests conducted pitted a human operator controlling the robotic nozzle with a joystick against the FlameRanger fully automatic guidance of the same robotic nozzle. The human operator extinguished the test fire in 20 seconds with approximately 380 liters of water, whereas the FlameRanger extinguished the same sized test fire fully autonomously in only 15 seconds and used only approximately 250 liters of water. In short, the automatic system worked faster and more efficiently than the human operator.”

▼ **The Unifire Force robotic nozzle can be mounted on a boom and hidden from view in the building's interior, such as on service floors. In the event of fire, it extends outward and begins extinguishing, retracting again when the fire is out.**



### Networked systems with InterAct™ GUI

Another revolutionary aspect of the system is the fact that an infinite number of systems can be networked together, and all can be remotely monitored and controlled over Unifire's new InterAct™ graphical user interface (GUI). Each system can be accessed from any standard computer, laptop, tablet or smartphone with a secure network connection and proper authorization, including over the Internet.

If a fire is detected on any system, authorities can be alerted immediately and authorized personnel can not only monitor the entire network but also take control remotely. Firefighters on the ground are thereby able to take control at the scene, whether or not the automatic feature has been engaged.

Moreover, each robotic nozzle “cell” in the system is able not only to work independently, but can also take in and react to data from the other “cells”. This means, for example, that systems can be programmed so that “a cell which detects a fire would suppress it, while the neighboring robotic nozzle could react by either assisting, or cooling and protecting surrounding equipment or structures,” Mr James explained.

### Test results

The FlameRanger technology underwent a series of full-scale fire tests in late 2015, which were conducted by the U.S. Naval Research Laboratory and Jensen Hughes. The results were, according to Mr James, “nothing short of amazing. Running completely autonomously with no human intervention whatsoever, the system was able to detect the fires and extinguish them in between 5 and 20 seconds.”

At all times, the system uses real-time data to direct the nozzles. This means that if the fire moves, changes size or position, or more fires break out, the robotic nozzle reacts accordingly, capable of suppressing up to four separate fires detected simultaneously.

### Future

Unifire first unveiled the technology in Dubai in January 2016 at Intersec, and has since been in talks with developers and governmental authorities. The company is optimistic that the first systems will be installed as early as 2017.

➔ **For more information, go to [www.Unifire.com](http://www.Unifire.com)**



# How to Battle High Rise Building FAÇADE FIRES

1

Within seconds from ignition automatically detect and locate the flame in 3D with 2 x IR Array flame detectors.



2

Automatically extend the robotic nozzle from its invisible installation & accurately aim the high-volume water stream directly onto the fire.



3

Automatically extinguish the fire within seconds from ignition. When the fire is out, turn off water & retract the robotic nozzle; remain in stand-by mode in case of any new fire.



## FLAMERANGER XT™

Fully automatic fire detection and extinguishing system for high rise building exteriors. To learn more about Unifire's fully automatic fire detection & extinguishing robotic nozzle solutions for a wide variety of applications, visit:

[wwwAutomaticFireFighting.com](http://wwwAutomaticFireFighting.com)

UNIFIRE

## What's New with... Nozzles and Monitors

With the greatly increased emphasis on firefighter safety, the leading manufacturers have boosted their research and development efforts to provide the end user with the safest, most efficient and reliable Nozzles and Monitors. In this Buyer's Guide we highlight the latest offerings from the worlds leading suppliers.



### AWG

In an emergency, firefighting equipment designed to fit into the hand is the only way to gain crucial seconds, deploy resources effectively and save lives. This basic principle has been the top priority for AWG for over one hundred years. AWG Fittings GmbH is a complete provider of fire-fighting fittings and fire protection systems. The experience gained from countless operations all over the world is incorporated into the development our equipment. State-of-the-art technology, easy and intuitive handling, robust reliability and always resource-efficient: these are the consistent features of modern fire-fighting systems from AWG Fittings GmbH.

Our range of nozzles covers the needs of firefighters in different situations all over the world. No matter whether they fight fires on ships, in buildings, industrial complexes, close to electrical engines or even in forests – AWG offers a proper nozzle.

The flow rates of our AWG Turbo Nozzles can be selected by the adjusting sleeve, opening and closing by means of the u-shaped handle. Turbo nozzles are equipped with two pointers, a good aid to feel the selected flow rate as well as the type of stream. These features form the basis of all different types of Turbo nozzles.

- Turbo Nozzles GOLD – a corrosion resistant must have for salty environment
- TURBOMATIC – automatically regulates water jet and flow rate to compensate pressure fluctuations
- Turbo Nozzle VENTURI – a self-inducting nozzle for the use of wetting agents

AWG also offers pistol nozzles, jet/spray branchpipes, HS nozzles, water shields, Euro nozzles, nozzles for special applications as well as different kinds of foam nozzles.

For more information, go to [www.awg-fittings.com](http://www.awg-fittings.com)

### Dafo Fomtec AB

Dafo Fomtec AB have a wide range of monitors and nozzles, all specific for their purpose but the one we like to highlight is the Balder portable oscillating monitor.

"This little beauty is very much appreciated by our customers", says Carl Rydén, Sales Manager at Dafo Fomtec AB. The reason might perhaps be that it was developed together with the Swedish Rescue board committee in order to comply with their requirements and avoid flaws on existing models on the market.

One such thing is the foldable tripod legs found on other portable monitors. We saw that when used on hard surface such as boat decks, asphalt, rock or even compact soil, it didn't do the job, the metal spikes were not able to keep the monitor in place and ensure safe operation for the professional users. On the Balder portable oscillating monitor the tripod legs are non-existent. The unique solution to stabilize the monitor – it is using the pressurized fire hose – is just one of many features that make it a good design.

Since the launch, we have supplied thousands of units, to fire brigades in Scandinavia, Poland and Germany, North Sea offshore installations and vessels world-wide. Balder portable oscillating monitor is compact, flexible, reliable and with a touch of genius. All in all it is like a condensed version of Fomtec.

For more information, go to [www.fomtec.com](http://www.fomtec.com)





## Darley

Since 1908, W.S. Darley & Co. has been dedicated to serving the world's Fire and Emergency Services and Defense organizations. Darley remains a family owned and operated business.

Our entire company is committed to customer satisfaction. We are dedicated to excellence and offer a diverse line of quality products and services through progressive design, manufacturing and worldwide distribution. Darley's involvement in the fire industry spans over a century and four generations of Darley family members.

Generations of firefighters have relied on the Darley catalog as the ultimate source in product selection. Whether you're in the market for high tech turnout gear, the brightest LED lights, uncompromising high angle rescue hardware or a simple Halligan bar, Darley carries it. Every edition includes an extensive list of new, must-have items for the fire, rescue and EMS professionals. Many customers also love the convenience of researching and ordering online at [www.edarley.com](http://www.edarley.com).

Whatever your fire fighting needs, Darley has the right equipment to do the job. We also offer a wide range of firefighting nozzles which includes CAFS, Industrial Fog, Forestry, Automatic and Booster nozzles.

In addition, Darley also offers Compressed Air Foam Systems (CAFS), apparatus, water purification systems, custom pump solutions and defense equipment.

For more information, go to [www.darley.com](http://www.darley.com)



## Elkhart Brass

Elkhart Brass is the industry's most experienced manufacturer of rugged, durable and innovative firefighting and fire protection equipment. Elkhart's global presence services fire departments, building systems, offshore drilling sites, mining, construction, military, marine, LNG and industrial firefighting markets.

Since 1902, Elkhart Brass has been introducing solutions to meet the challenges firefighters face every day. We have an impressive list of safety features and a record of uncompromised quality and reliability that allows Elkhart not only to lead the industry but take the industry standards to a higher level.

Elkhart Brass' nozzle line offers a solution for every challenge. Our extensive line of nozzles and accessories equips you with the ultimate firefighting weapon for your application. Technologies are continually being developed as new materials become available

and the specific needs of our customers are being addressed.

From manual, to electric and radio frequency, Elkhart Brass is the established leader of monitors and control technology. We develop and manufacture the largest selection of rugged and durable monitors. Our selection includes options for every demand including lightweight, small spaces, aerial, high flow, deicing, ARFF, industrial, military, mining, construction, marine and more. Flow capabilities up to 5000 GPM/19,000 LPM and nozzle options designed to deliver!

Elkhart Brass' commitment to quality, value and customer service show in every product we develop. Elkhart Brass is a global leader and a Safe Fleet brand. As Safe Fleet, all our brands strive to make Your Safety Our Mission.

For more information, go to [www.elkhartbrass.com](http://www.elkhartbrass.com)



## FireBug

Born in the UK, FireBug manufactures and supplies to fire and rescue services, and Original Equipment Manufacturers with high quality, water mist fire fighting equipment and cutting-edge technology.

Committed to the research and development of unique technologies for the firefighting industry, through a dedicated development program, the company specialises in harnessing the power and simplicity of water mist in the extinguishing of all fires, including class B and class F fires.

Working in partnership with a number of fire and rescue Services, firefighting equipment distributors and leading fire suppression experts, all fire and rescue apparatus is tried and tested to the maximum, being designed, created and recreated until they are perfected.

The product range includes a fire-service

vehicle range of customised fire vehicle bodies built to order, a range of firefighting skid units known as the 'MistMax', floating pumps and strainers, portable water mist fire suppression kits in a backpack form 'BacPac', fire fighting misting nozzles including the 'MistNozzle' and more.

The fire extinguishing equipment range is unique, easy to use, safe for the firefighter and focuses on water saving at the core of each design, due to the 100% environmentally friendly water mist technology used.

The FireBug team are dedicated and committed to making the FireBug experience positive and enjoyable. The team works with an elite number of customers to distribute their technologies through the United Kingdom, the Middle East, Europe and The Africas'.

For more information, go to [www.firebuggroup.com](http://www.firebuggroup.com)



## THE PERFECT COMBINATION TO FIGHT FIRE



RYLSTATIC - The Ultimate concept in Fire Fighting Nozzles

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## Our employees fight fire and so do our products



*My name is Magnus. I am working with product development at Fomtec. This picture is from a fire test in Sweden. Follow us if you want to find out more about me, the Fomtec way and all our products.*

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Webpage [www.fomtec.com](http://www.fomtec.com)

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Fire Fighting Foams & Equipment



## First Strike

The Vindicator was designed to address the two most important factors in fire suppression with water, application rate and type stream, as well as adding one more element to the equation, reducing the flame temperature by modifying the air.

The Vindicator satisfies the requirements of both a high rate of application and a broken stream for high heat absorption. The Vindicator offers higher flow rates than found with either a spray nozzle or a solid stream nozzle, while doing so at less nozzle pressure, with increased mobility and safety, and with less steam generation. Because it is an aspirated stream it has the advantage of being able to remove heat from the combustion zone to slow the reactions by cooling the combustion by-products and delivering them back into the fire matrix. This is an advantage not found in either the solid stream or the combination nozzle. The Vindicator has a higher surface-area-to-volume ratio due to the coupling of high application rate (gpm) and its effective aspiration. Therefore, it has better heat-transfer characteristics than conventional nozzles and, consequently, is more effective in absorbing heat and proven so with independent testing.

Since the Vindicator is supplying an air-aspirated stream it is an excellent choice for flammable liquid fires and foam applications. The water droplets are large droplets and are less affected by wind or thermal columns. Thus, it allows more water to be placed on the flame-fuel interface.

If suppression is your goal, the Vindicator should be in your tool box!

For more information, go to [www.vindicatornozzle.com](http://www.vindicatornozzle.com)



## Knowsley SK

Knowsley SK is renowned for the design and manufacture of firefighting systems for the protection of high value Oil, Gas & Petrochemical installations. The KSK brand is recognised worldwide with an extensive reference list of end user sites and applications.

The manufacture of monitors and nozzles is a specialisation of Knowsley SK drawing on 120 years of experience to ensure the right product solution is matched to each application; whether that be simple cooling applications using fixed monitors or sophisticated remote operated foam monitors installed in extreme environments and hazardous locations we have a solution to suit all needs and an extensive history of project experience to ensure we provide the most appropriate advice on industry best practice.

Monitor types available range from portable, mobile, fixed, oscillating and remote controlled with flowrates up to 2000 USGPM (7600 l/min) and are manufactured in high quality corrosion resistant bronze to ensuring reliability in the harshest locations. Internationally recognised



approvals are available and a continuous development program ensures that Knowsley monitors remain at the forefront of technology.

Knowsley SK is able to offer bespoke solutions integrating monitors into mobile trailer solutions or fixed skid packages incorporating foam storage and proportioning equipment and control systems.

For more information, go to [www.knowsleysk.com](http://www.knowsleysk.com)

## LEADER

As a major player in the fire market, LEADER affirms its presence by diversifying its products' families and proposing new "response equipment".

Nozzles are subjects that LEADER knows very well! Recognized as a leader in the development of rugged and innovative firefighting equipment, the R&D team from LEADER has designed a range of nozzles combining technicity, ergonomics and performance with a great spray/jet quality.

LEADER now offers selectable and automatic nozzles:

- MultiFlow: Selectable flow nozzles
- FlowMatic: Automatic nozzles
- MultiMatic: Automatic nozzles with selectable flow
- HP Matic: High Pressure automatic nozzles

LEADER nozzles are available in 2 materials: aluminium or FiberTech® composite

Firefighter responders are used to work with aluminium and brass nozzles. They now have the choice for a new material: the FiberTech® composite from LEADER. Always at the cutting edge, LEADER is introducing composite material into the design of firefighting equipment with properties equal or better than those of ordinary materials.



[www.iffmag.com](http://www.iffmag.com)

For more information, go to [www.leader-group.eu](http://www.leader-group.eu)

## National Foam

The National Foam Iron Man monitor is a trailer mounted high capacity flow device which forms a key part of the Big Flow High Capacity Mobile Firefighting System. The Big Flow System is a mobile, pumping system capable of feeding large volumes of water (3,000 to 6,000 USGpm) over extremely long distances. Big Flow comprises a number of high capacity water pumping options (including floating satellite pumps), large diameter hose (up to 12") and associated deployment devices, all designed to ensure the correct volumes of water, and where applicable, foam is fed to the Iron Man monitor.

The National Foam Iron Man is available in many configurations and is usually supplied in a trailer configuration although it can also form part of a close coupled pumping unit. It is available in a number of flow options with interchangeable tips delivering up to 12,000 usgpm and capable of throwing in excess of 400 feet. The Iron Man nozzle is capable of changing its stream pattern from straight stream to semi-fog via an integral hydraulic patterned control system.

The Iron Man and Big Flow combination offers a highly effective, mobile solution for



fighting fully involved, open top floating roof tanks and similar major fire hazards.

For smaller hazards, the National Foam Terminator II mobile water delivery device is available. It can deliver 1,500 to 3,000 usgpm through a self-educating Gladiator nozzle and features straight stream to fog pattern adjustability, turn and click flow adjustment and a self-levelling stability system.

Combining these units with National Foam Universal Gold foam concentrate gives a total firefighting solution delivering optimum performance.

For more information, go to [www.nationalfoam.com](http://www.nationalfoam.com)

## NewAge

NewAge produces a wide-range of high quality monitors and nozzles to meet the varying demands for fire brigades, industrial fire hazards, and for marine applications. Typically, we can divide the product range into 3 categories: 'portable' monitors (low flow – under 4000 LPM); 'vehicle-mounted' monitors and 'fixed' monitors (both in the mid-flow 2000-8000 LPM and high flow of 10,000 to 40,000 LPM ranges).

Monitors are equipped with detachable nozzles and solid bore tips and adjustable straight stream and fog nozzles which can be either "fixed" gallonage or "automatic" types. All monitors can be equipped with very economical self-educating foam nozzles.

Monitors and nozzles are available in brass, aluminum, and stainless steel material depending on weight or environmental issues. The control of NewAge monitors and nozzles depends on category and user requirements. Low cost manually operated units are normally standard while, electrical and hydraulically operated units



are becoming more popular. Such "powered type" monitors can be locally or remotely operated with wired or wireless remote control options. Electrically operated vehicle mounted monitors can be equipped with optional joy-stick controls, dual operator panels, and wireless remote controls. Electrically or hydraulically controlled fixed monitor control panels and systems can be either low voltage (12/24V) or high voltage (120/240V or higher), and in either non-explosion or explosion proof models.

Newage can also offer U.L. listed and NFPA compliant monitors and nozzles. Due to varying hazards and user demands, engineering services are available to customers for custom or standard monitor and nozzle configurations.

For more information, go to [www.newagefireprotection.com](http://www.newagefireprotection.com)

## POK

At the beginning of the 1980s a new kind of nozzle arrived in Europe. Before that time, Europeans built nozzles with a straight jet and a long throw, or an attack spray with a fixed angle - both nozzles provided droplets of an average size.

Then a new kind of nozzle appeared on the market which was originally used for oil tankers that had a reshaped straight jet and adjustable spray. Firefighters were enthusiastic about them and this led European manufacturers to adopt this new technology. The distance of throw distance of the new reshaped jet nozzles quickly performed as well as oil tank nozzles. They produced thin droplets that could absorb heat faster, or droplets of an average size necessary for a longer throwing distance that had all the advantages of the different shapes.

Today, most of the worldwide manufacturers manage to produce monitors and nozzles meeting diverse levels of requirement. Some insurance companies invested into studies to better understand the parameters that matter the most in extinguishing fire quickly and efficiently – they even offered equipment to some fire brigades. By utilising the latest equipment resulted in savings for the insurance companies due to the reduction in damage caused by fire and water. Monitors with much higher flow rates were developed in parallel and forty years ago, a monitor capable of delivering 2,000 to 5,000lpm was towed behind fire trucks. Today the same monitor weighs less than 10kg, fits easily in a fire truck and can be operational on-site very easily.

Our newest kind of nozzles and monitors are powder-foam extinguishers. The foam carries the powder at the right distance and the speed of extinguishment is remarkable: the foam reduces the temperature and the powder suffocates the fire! Helicopter platforms on French frigates are protected by POK's powder foam monitors.

For more information, go to [www.pok.fr](http://www.pok.fr)





## Protek

Protek Manufacturing Corp. is a leader in providing high performance fire fighting equipment. For over 40 years Protek has adhered to delivering high-quality products, creating value for customers and providing exceptional service. We offer a wide range of products from handline and master stream nozzles to fire monitors, foam equipment, wyes, valves and a wide selection of accessories. We are constantly improving existing products and developing new products in order to tailored to the evolving needs of our customers.

Protek offers a premium selection of handline nozzles that are designed for all fire ground needs. Our suite of Selectable Gallonage Nozzles, Multi-Purpose Nozzles, Automatic Nozzles and Constant Gallonage Nozzles offer a versatile range of flow-control settings, suitable for various industrial, municipal and marine applications. Our wide range of Foam Nozzles feature inbuilt eductors, high-pressure applications, foam pattern control and dual agent flexibility, suitable for various foam types, including AFFF, AR/AFFF, Class A and Haz Mat foams. All nozzles are compatible with Protek's Foam Aspiring Tubes.

Protek's wide selection of high-quality monitors optimise advanced computer aided design and testing technology, offering features such as cast-in vanes for high flow efficiency with minimised flow turbulence. Our Industrial Monitors are highly manoeuvrable and easy to operate, offering optimal coverage in industrial, mining and marine environments. Our technologically advanced Wireless Remote Control Monitors facilitate the effective use of personnel and lowers the potential risk of injury from manual operations. All monitors are compatible with Protek's diverse range of master stream nozzles.

For more information, go to [www.protekfire.com.tw](http://www.protekfire.com.tw)



## Rosenbauer

When form and function unite, modern technology becomes an experience. The Rosenbauer turret control is part of a new and complete firefighting equipment package for ARFF and industrial vehicles. All components are optimally matched and are further evidence that modern firefighting technology can look stylish.

Improved overall performance, higher throw ranges, more precise beam guidance: the external appearance of the newest Rosenbauer firefighting equipment does not immediately reveal that which lies within. The turret controls must be as sensitive as possible to achieve absolutely precise extinguishing. Slow movements are more likely to hit the mark than fast movements. The main requirement is that the turret executes exactly what the operator is dictating on the joystick.

Rosenbauer offers a product palette of electronically controlled turrets ranging from 600 to 15,000 l/min. All turrets are now operated using the newly developed turret control, which has improved interaction with the turret even further. The joystick executes the movements of the hand with even greater sensitivity, which facilitates even more exact and precise motions. The operator is also supported by a number of new functions: four status LEDs on the handle convey information about extinguishing agent volume and the selected extinguishing agent type. An illuminated direction indicator on the control handle indicates to the operator the current direction of the turret in a simple fashion. Furthermore, the buttons are universally arranged so that the function of each button is the same on all Rosenbauer control handles and joysticks, including the newly developed 5-axis joystick for operating the STINGER HRET.

For more information, go to [www.rosenbauer.com](http://www.rosenbauer.com)



## ANSUL

ANSUL foam monitors and handline nozzles are backed by a 100-year legacy of proven quality and performance. Our products are tested at the ANSUL Fire Technology Center, one of the most extensive fire research and testing facilities in the world. ANSUL offers many monitor models, including manual, electric-remote controlled and water-powered oscillating with a variety of nozzle options including master stream non-aspirated monitor nozzles, and AFN air-aspirating nozzles. ANSUL monitors and nozzles can be used with an array of foam concentrates for a wide range of applications, including refineries, loading docks and ARFF vehicles. ANSUL nozzles are constructed of corrosion resistant materials, and are lightweight for ease of handling.

For more information, go to [www.ansul.com](http://www.ansul.com)



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## R-PONS

R-PONS has been a leading French manufacturer of firefighting equipment (fire brigade equipment, hose reels, monitors and couplings) for over 100 years.

We have our own R&D department, foundries (pieces in gunmetal, aluminum and stainless steel), MIG and TIG welding lines, and a last generation machining workshop.

This total control of our production process makes us flexible and we can easily adapt our products to the different requirements and international standards.

Quality and customer orientated, we take advantage of an international fame in the industrial, oil and gas, chemical, and fire brigades markets, which make R-PONS a key player in the firefighting market.

- Hand nozzles – from 150 to 1000 l/min, adjustable flow-rate or self-regulated pressure
- Monitors – from 1000 to 10000 l/min, portable or fixed, manual or hydraulic oscillation
- Hose-reels – in compliance with the NF EN 671-1 European Standard
- Fire brigade Equipment
- Couplings

R-PONS also produce the following recognized safety innovations;

- An adjustable pressure regulator REGUPONS, the right solution to ensure the total safety of the operator in case of over-pressured fire networks.
- The patented VSC safety device, equipping our portable monitors COMPACTOR and COMBITOR, reducing instantly the water flow and pressure in the monitor when the slight uncontrolled move occurs, without any additional stowage system.
- The 'extra' compact MICROTOR, is a 1000l/min portable monitor, weighing only 3.5 kg, with a reach of 50m at 6 bar.

For more information, go to [www.r-pons.com](http://www.r-pons.com)

**r. pons**  
WWW.RPONS.FR

## Task Force Tips

As the recognized global leader in innovative nozzle and monitor design and development, Task Force Tips, Inc., with manufacturing and operational headquarters in Valparaiso, Indiana USA, has exceeded emergency responder expectations for suppression performance since 1971. Credited with the invention of the automatic, or constant pressure variable gallonage nozzle in 1968, TFT today offers a full range of automatic, as well as fixed and selectable gallonage handheld and masterstream firefighting nozzles.

Meeting global standards for handheld nozzles such as NFPA, UL, FM, ATEX, CE/EN ISO and CCC, the TFT product line offers over 800 models and configurations to meet any agency's fire suppression challenges. From the smallest models designed for 25mm/1" hoselines with flows from 37 l/min / 10gpm up to 65mm / 2 1/2" hoselines with flows to 1150 l/min / 300gpm, all handheld nozzles are produced from stainless steel and high strength lightweight anodized aluminum alloy for maximum durability even in the harshest firefighting environments. Pistol grips and valve shut offs are produced from DuPont's ZYTEL® super tough nylon and are easily color coded for identification. Many nozzles offer the IMPULSE™ trigger valve operational design as an option, and over 25 models have been developed specifically for pulsing and compressed air foam applications including the G-Force™

## SKUM

SKUM, a leading brand of Tyco, is well known and respected for the design and innovation of fire-fighting monitors. With more than 75 years of experience in research and product development, SKUM monitors can deliver large quantities of foam accurately to the hazardous areas from a safe distance. The adaptable foam monitors are used to suppress fires in a wide variety of special hazard and high risk applications, which can be either portable or fixed, with variations allowing them to be operated either manually or remotely delivering between 500 liters per minute (lpm) and up to 20,000 lpm.



global nozzle platform. All models accept low or medium expansion foam attachments for improved finished foam performance, are individually serialized for asset tracking, and most offer three distinct fog pattern tooth designs.

Additionally, Task Force Tip's broad range of portable, transportable, fixed and remote controlled firefighting monitor systems fill operational demands for high volume mobile appliances to 5000 l/min / 500gpm, apparatus integrated manual and remote controlled models to 7600 l/min / 2000gpm, and industrial applications to 30,285 l/min / 8000gpm. For over 45 years, TFT has produced nearly 8,000 water flow, foam application and fire suppression products that global customers have relied on for safe high performance operations and our commitment to continued innovation new product development will be noted during the next 45 years of service.

For more information, go to [www.tft.com](http://www.tft.com)

For more information, go to [www.skum.com](http://www.skum.com)



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## Tipsa

As a leading manufacturer of Fire fighting Equipment with more than 60 years of experience, TIPSA is committed to provide first-class products to professionals who risk their lives in the line of duty. TIPSA produces hoses, nozzles and GENFO water back packs for municipal, industrial and forestry brigades.

TIPSA offers a complete range of High Quality Fire Fighting Nozzles including the models of Selectable, Constant, Automatic and variable Gallonage Nozzles mostly covered by VIPER Nozzles Line.

TIPSA it is an Innovative company that it is constantly improving its product line in order to offer better products using the latest technologies. The BLUE DEVIL line it is the reflect of the newest developments of TIPSA that it is offering a complete line of high performance selectable flow nozzles going from 25 up to 950lpm (5 to 250 GPM). The BLUE DEVIL line of Nozzles accomplishes the main standards such as EN-15182-1, EN-15182-2 type 3 and NFPA 1964 Standards.

TIPSA it is constantly certifying nozzles, the most relevant product certificates of nozzles are EN-15182-1, EN-15182-2 type 3, GOST-R, CNBOP-PIB and MED.

TIPSA is collaborating with universities, technological centres and laboratories to offer new solutions like RYLSTATIC, a patented system that works without spinning teeth and creates a more uniform FOG with smaller water droplets increasing the humidification power. RYLSTATIC system is able to create a good fog even at lower pressures due to its low friction losses. RYLSTATIC it is available in the BLUE DEVIL and VIPER ATTACK line of nozzles.

For more information, go to [www.tipsa.com](http://www.tipsa.com)



## Unifire

Unifire AB of Sweden has introduced to market its next-generation Force™ remote controlled fire fighting robotic nozzle systems.

These state-of-the-art systems feature high-end, industrial-robot-type brushless (BLDC) motors, stainless steel 316L construction, and cutting-edge TARGA™ PLC. TARGA enables Unifire to now offer a wide-range of advance control system options, which include the Unifire's InterAct™ graphical user interface (GUI), the Unifire FlameRanger™, a fully automatic fire detection & extinguishing system, and more.

InterAct provides users the ability to securely monitor and control one or more robotic nozzles and other connected peripheral devices from a touchscreen PC in a vehicle cab, or from a computer, tablet, smart phone or any other web enabled device, such as in a control room. The intuitive interface has a virtual joystick and can display the nozzle's position, tank levels, open and close valves,

show alarms, show camera feeds, provide function buttons, and monitor and control any other device on the system. Unifire customises the interface to its customers' needs, including language settings, functions, etc.

Unifire's FlameRanger is a revolutionary system that uses IR array flame detectors to automatically detect and locate the exact size and 3D position of fire and begin suppressing it with the Force robotic nozzles, with pin-point accuracy, within seconds of detection. The system automatically shuts off the water as soon as the fire is extinguished, yet remains in active stand-by 24/7/365. In multiple full-scale fire tests conducted by the U.S. Naval Research Laboratory and Jensen Hughes, FlameRanger was able to extinguish fires in 20 seconds or less.

For more information, go to [www.RoboticNozzles.com](http://www.RoboticNozzles.com)  
[wwwAutomaticFireFighting.com](http://wwwAutomaticFireFighting.com)



## Williams Fire & Hazard Control

Williams Fire & Hazard Control, part of Tyco Fire Protection Products, is a leading brand in innovative monitor and nozzle technologies to combat the most challenging industrial and municipal fires. Our extensive experience in developing monitors and nozzles has helped to shape the industry. From the world's first self-educating nozzles to the patented Hydro-Chem nozzles, Williams Fire & Hazard Control products are engineered to offer the greatest reach, muzzle velocity, and stream efficiency to overcome real-world challenges and help protect personnel. Our monitor and nozzle packages offer flows up to 37,800 lpm (liters per minute). Innovative

designs provide unique features to enable the flow of firefighting foam solution through on-board self-education, or remote proportioning. Hydro-Chem nozzles deliver dry chemicals along with water or foam solution to combat three dimensional or pressurized fires.

For more information, go to [www.williamsfire.com](http://www.williamsfire.com)



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For firefighters.



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The equipment we build is the equipment we use in fighting the world's most challenging fires. With more than 30 years in the field, Williams Fire & Hazard Control has earned a reputation for response equipment engineered with the firefighter in mind.

Learn more [www.williamsfire.com](http://www.williamsfire.com)



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**BALLYCLARE**

## Ballyclare donates to Argentinian Fire and Rescue Services

Ballyclare is always pleased when we are able to support the fire and rescue community. Over the years we have donated protective clothing to charities and countries across the world to help protect firefighters who often wear badly maintained kit, or no protective kit at all.



**Jim Dave MSc FIFireE**



**Ben Walker**

Jim Dave is a Station Commander with the States of Jersey Fire and Rescue Service. He joined in 1993 and is currently working in the Technical Fire Safety Department.

Ben Walker is an award winning International Presenter & Innovative Trainer of Firefighters and author of the book *Fire Dynamics for Firefighters*.



One charity we work with is the International Fire and Rescue Association (IFRA) that has been helping fire and emergency services worldwide since 2002. We recently received a convoy report from IFRA which included how donated kit from Ballyclare has made a real difference to crews at several fire stations in Argentina.

Ballyclare Limited is a British designer, manufacturer and distributor of high quality, functional workwear, protective clothing and specialist PPE. We are a trusted producer of structural and specialist firefighting kit and protective clothing for the emergency services and armed forces as well as supplying managed services encompassing garment supply, leasing, repair and laundering.

For more information about the IFRA take a look at their website [www.ifra.co.uk](http://www.ifra.co.uk).

### Convoy 56 Argentina

#### Monday 5th October

Left Jersey early evening hope this isn't a sign of how the mission is gonna go. Delayed for what we were told was a technical hitch but then eventually the police boarded the plane to arrest somebody. Bit of drama. Because of this I missed my coach and when I did get to Heathrow left luggage was closed, bit of a walk with all my kit. Eventually got to my mums at 1:00am had a beer then bed.

#### Tuesday 6th October

Woke up feeling ok. Had a few things to do this morning to get ready for the off. Planning to meet Ben at 5:30am at Terminal 3. Met up with Ben ok and

▼ Preparing for a protracted  
USAR drill at Merlo San Luis.



Image courtesy of IFRA



checked in. Managed to get some seats with extra leg room which will make a massive difference. 12 hour flight squashed into a seat is not fun. Went through customs and had a beer while we caught up on what we'd been doing for the past year. Boarded and settled down for the night.

#### Wednesday 7th October

Arrived in Brazil at 5:30am local time. Flight over was not a good one but we pretty much expected that. Worked our way through immigration and made our way onto Terminal 3 for the flight into Córdoba Argentina. Had a bit of breakfast while we waited and some fantastic coffee, very nice. Me and Ben talked about the delivery of training and how we are going to manage 70 odd firefighters between two of us. Not sure how yet but we will work it out. Was met by Ricco and Matias at Córdoba, from there it was a four hour trip to Merlo. Chatted for a good part of it as there was a lot to catch up on but eventually the tiredness caught up and I nodded off. When we got to station there was only a few lads around as it was the 'Our Lady of the Rosary' Saint's Day and most of the watch was at the church. Had a shower and sorted our kit out then went to chat with the lads for a bit. As everyone was out Ricco took us to eat at his house. That was a good idea as the station would not eat until 11:00pm-ish and we really needed some sleep. It was good to meet with Abby again (Ricco's wife) we had a tour round the house as last year it had only just been built so a lot of work had taken place. Matias joined us and we had a nice dinner and chatted about tomorrow. Afterwards went back to station, the lads were back but not for long as they turned out to a car fire. Ben was knackered and went to bed I stayed up chatting for a bit and then turned in after the lads got back.

#### Thursday 8th October

Got up at 7:00am after a good sleep. Ben was already up; think he woke himself up talking with himself in his sleep. Had breakfast with the duty watch. Ricco and Abby turned up on their way to work and had a brew and a chat. Walter also came in to say hello it was great to see him. Abby translated for us as we talked about our year since our last visit. A lot has happened to Walter, mainly him retiring as chief and passing the reins over to Matias.



Image courtesy of IFRA

He made us feel extremely welcomed again and made us feel part of the Bomberos family. For my part it doesn't feel like we have been away and it's nice to feel at home and be relaxed.

Today we are visiting other stations around the region. It will be interesting to see how far they have moved on with their operational development and how the stations have moved on with their construction. Me, Matias, Ben and Yago are doing the trip. Yago is our translator, his English is good and Abby says it will be good experience for him. She is his English teacher. First stop Villa del Carmen. Last year this station was just starting out they had no kit what's so ever. The only thing they had was three beaters. It's not often you get to see the result of what IFRA actually does. The donated kit from Ballyclare has made a massive difference.

The transformation was in incredibly humbling. They now have a small truck with

▲ Concaran firefighters taking part in a large exercise involving multiple vehicles including LGV's.

a small pump and adapted water container for the water supply. Fire kit and basic firefighting kit. The transformation was amazing. What's most satisfyingly about this is hearing the stories of how they are helping their communities and the people they are helping to save. Although there is a long way to go for Ville Del Carmen they are moving in the right direction.

Next up was the town of Papagallos. This is a new station that is only a year old. Thirteen firefighters man this station. Again as they are starting out it is very basic with very little in the way of kit. We had a look at the truck which is believed to be 60 years old but still has a working pump although all the print has worn off the gauges. Fire kit that they did have (not enough for everyone have to share) is leather and in a bad way.

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Image courtesy of IFRA

Villa Larca was the next region we visited. Although the station had not had any more building work done on it (due to funds) they have just taken delivery of a new truck. Very little equipment but still a very much needed vehicle for the town.

We went on to Los Molles to view the station and then onto Carpinteria. Carpinteria have been busy with a lot of work. Good to see the stations that are working hard and moving forward. All this work is carried out by the Bomberos with taxes from the region and from donations from the community.

#### Friday 9th October

Today we are visiting the rest of the stations within the region. Rico, Matias and Walter are with us today. Can't believe the weather wind and rain and very cold 9 degrees. There is snow in the mountains which is strange to see. It might snow in the town tomorrow as it is predicted. First stop is Naschel. This is another station that has moved forward during the past year. The day they took delivery of the fire kit that IFRA donated from Ballyclare they attended a large warehouse fire. Having decent fire kit made a big difference to their

capability and how they dealt with the fire. It was refreshing to see the chief adopting an IRMP style about the risks that are local to them. RTC and swift water are the main risks that they encounter and it is good that they are actively trying to purchase equipment for this areas. Funds are slow here in Naschel but it is becoming better as the community can openly see the work they do and the development of the station.

Next up the town of Tilisarao. Good to see all the fire kit from IFRA/Ballyclare going to good use. They plan to extend and make good a large garage they have so they can rent it out to raise some extra cash. Last month they lost a truck to a large open land fire. The wind changed direction and rapidly surrounded the appliance and crew. Eventually, after being trapped inside for a spell, the crew had to jump out and run through the advancing fire or be consumed by the flames. Although they made it through to a place of safety all four received burns. The worst having burns to the face. They are on the mend but it might be some time before they return to duty.

Renca. Lots of development within the station. They have a close working relationship with Merlo and have received

▲ This was the result of a change of wind direction at a wildfire in Tilisarao. Two Bomberos injured.

one of their old vehicles, an appliance sold to them at a very cheap rate from Merlo. Good, moving forward and planning to develop further.

Concaran: Not much happened here not sure why a little bit of construction. Truck donated/sold to them by Merlo. Big drill here tomorrow night. 50 firefighters and a big field. What can go wrong?

Santa Rosa: Met by the chief the governor and all the local administration that run Santa Rosa. All the Bomberos and Carlos and his sister who were from Chicago so acted as our translators. This was also our lunch stop. A full on sit down meal with all the dignitaries. Food was great as normal and we talked over lunch (three hours worth) about how the station had taken on board our advice from last year. They have concentrated on sorting out their PPE and delivery of training to become more competent. Further grow in the station and ways of generating more money to help support the Bomberos. Still

in talks with national government to try and sort out better funding. After lunch we were interviewed by the local TV station about our time in Argentina and the training we are delivering. We were presented with some gifts and an engraved tea set for Davie. Ben will have to deliver that hehe. Our time was cut short as we needed to get back as the lads from Merlo were very busy trying to sort out all those that were stuck on the mountain that had gone up to see the snow.

It's still really cold. Drill went well with more hazmat lectures. Spent an hour on the ERG book and then did some practical exercises. Went very well nice to see the info is getting through.

#### Saturday 10th October

Had a much need lie in this morning until 9:00am. Still really cold and a lot of snow in the mountains. This is causing a lot of grief for the Bomberos with people sliding off the road and in some cases down the side of the mountain. We left to set up the day's drills at midday. Today we are drilling at Concaran In a field opposite the station. We have 50 plus Bomberos and only me and Ben. The plan is to run a hazmat drill involving a tanker and two cars which have

caught fire. The other half of the crew will be doing various tasks competing against one another.

Basically get themselves from A to B and all their kit with minimum assistance. Shark infested custard type of thing.

The drills were ok and the competition stuff went down a treat as the lads are very competitive. The fires in the cars were meant to be burnt with wood but me and Ben didn't notice the mass of tires that went on. You can guess the rest.

#### Sunday 11th October

The longest day. We started at 9:00am and we finished at 6:00pm. Although we stopped for lunch for an hour and a half it was a killer. We covered hazmat and collapsed structures. They had set up a simulation that had a building had collapsed with access via a trench. Me and Ben pulled the plug on the trench as it was very dangerous. Lots of debate about it but we couldn't allow it. After three and a half hours of lecture we got to work in the drills. It was refreshing to see the command and control starting to kick in. They are not used to working in large teams so this made it even more pleasing to see. Dinner

tonight is Asado (BBQ). I managed to get a couple of hours sleep as I'm Knackered. Tomorrow we continue at 9:00am.

#### Monday 12th October

Today we did some basic FBT and door entry which Ben took and I did search and rescue with them. Covered left and right hand search and basic BA. It went well with a lot of them remembering what we did last year. Afterwards we had some lunch and then the presentation of the certificates as this was the last days training. We had a couple of hours to kill so we drove into the mountains to see the snow that had now melted. It was very cold up there but the views were spectacular. Later that evening we did a radio interview that is run by the Bomberos from Merlo. Lots of questions about IFRA and what we do. It's a weekly program just related to fire stuff. After that we had dinner at Ricco's with his wife Gabby and Matias. Got to bed at 1:00am very tired.

▼ Fire behaviour training. Theory (left) and practical (right).

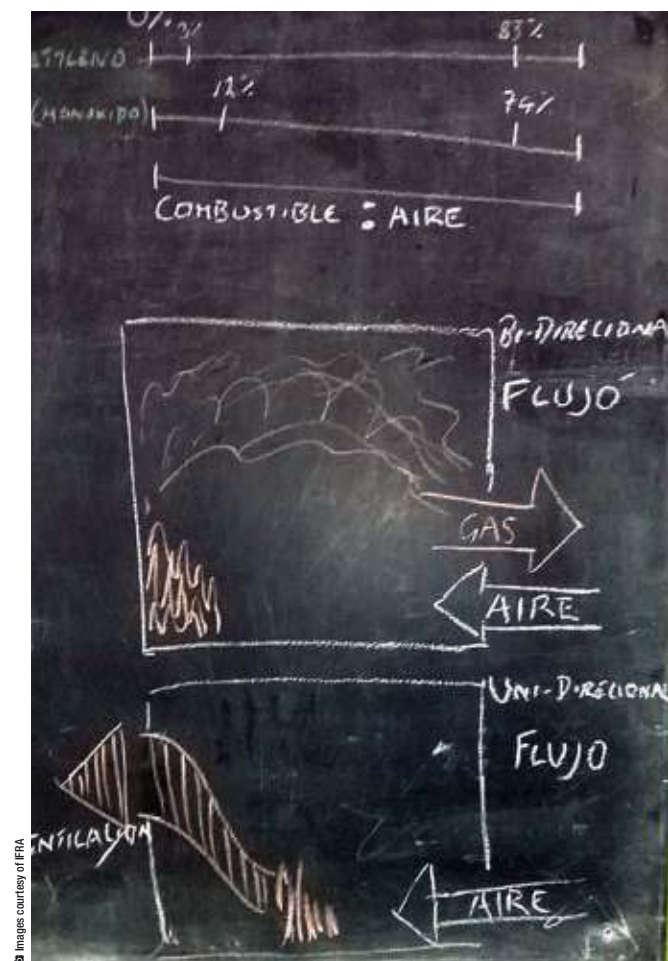


Image courtesy of IFRA







◀ Ben Walker and Jim Dave from IFRA setting up a road traffic collision at Concaran.

Lunch at 1.30pm then training from 3:00pm, gonna do some FBT and a dolls house. Looking forward to it.

#### Saturday 17th October

We had to be up early to make it back into town where we would be training at Station No.5. Today was mainly police and we were due to train all day with them. There was a change in subject matter and we delivered incident command training.

#### Sunday 18 October

Most of the morning was made up of the presentation of certificates to everyone and lots of speeches. Afterwards we went to lunch with Damian and Guillermo where we talked about future trips away and the possibility of them visiting the UK for training.

#### Monday 19 October

Bit of a wasted day. We hung around for most of it waiting to leave not really knowing what was going on. Eventually we left at 3:30 pm. We stopped along the way and visited another station about 100k outside of Petrero in a town call San Francisco. Chatted to the lads and toured the station. We arrived in Merlo at 8:00pm, it was a long journey. Everybody was here to see us Ernesto and his wife came down and stayed to eat with us. More beef which was very good again. More speeches and presentations then done. Looking forward to going home, been a long trip the extra days have made a big difference.

#### Tuesday 20 October

Didn't do a lot today just hung about. Went into town for coffee and to do a bit of shopping. Packed again for the last time made sure we were ready for the off tomorrow. We are going to leave about 8:00am ish and have some lunch at Córdoba flight is at 5:30pm. Another IFRA mission done and a massive difference made and it's when you come back you realise how much all these countries need IFRA and its supporters.

➔ For more information, go to [www.ifra.co.uk](http://www.ifra.co.uk)

#### Tuesday 13th October

Got up at 8:00am and had a bit of breakfast. We had another interview to do at a radio station we did last year. 15 minutes with the same sort of questions then done. Went up to look at the springs from last year only this time it was too cold to go for a dip. Although the sun is out now it's still a bit cold. Rafael and Luis are coming down to collect us and take us back. Tomorrow we start it all over again. Met with Damien and Jose and all the lads and lassies from the station. They had prepared Asado which took until midnight so another late dinner for us but normal for Argentina. Had to leave and get zzz after we eat so tired.

#### Wednesday 14th October

Up at 8:00am for breakfast then on to San Luis capital for a TV interview on a morning breakfast program called Unbuena Manana then onto a local paper for another interview. After that we covered command and control. From the sound of it we will be delivering only classroom based training. That's a lot of presentations. I can see we are gonna have to write some more as we are absolutely going to run out. The subject matter we were told we would be giving is not what is being given. But that's normal.

#### Thursday 15th October

Breakfast followed by the same routine. Visiting stations around the province and lots of media duties. The difference in equipment and conditions between each station is vast. Some really needing a lot of work on them others are ok. It was promising to hear that the regional governors have promised to invest in the development of stations if elected.

Training was another 4.5 hour session. We continued with the command structure this time looking at risk assessment. We mixed this up with some practical exercises where they were split into teams and given the task of carry out a RA on the building we were in. This was also used to consider the same building being involved in fire. The results were very satisfying as there was a good grasp on the process by most.

#### Friday 16th October

First stop La Punta. We visited the rest of the stations in the province La Punta and two whole time stations nearby. Station No.2 is Police which is in a football stadium. After that we went to the chief's station which is Station No.1. This is where Rafael is based. It was good to see him as we have not had a lot of time to chat.

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# Loyalty: the firm foundation for an effective fire department

Many times during my career I have been accused of being just a bit too “touchy-feely” for many in my approach to preaching the gospel of fire department organizational effectiveness. There are those who have said, “You gave too much of yourself to your subordinates.” There are those who have said that I have cared more for my people than the organization itself.



**Dr Harry Carter**

**Dr. Harry R. Carter currently serves as Chairman of the Board of Fire Commissioners for Howell Township Fire District #2. He enjoyed a 26-year career with the Newark, New Jersey Fire Department. He has also had a 43-year career with the Adelphia Fire Company in Howell Township, NJ serving as Fire Chief in 1991.**

**T**o those of you who have leveled these criticisms, I would like to offer a heartfelt thank you. You have focused me on what I need to say. My response is simple. You can never care too greatly about your people.

In the first place, thank you for reading my many and varied commentaries over the years. Feedback is the only way that a writer can tell whether he or she is hitting the mark. In the second place, let me thank you for taking the correct read from what I have been saying about leadership and management. After many years of writing, I still strive to be relevant. And I want to share my deepest, most important beliefs with you.

Yes I cared more for my people than the organization. I always have. Why? Because I really do believe that people are the most important part of any organization. In fact, they are the organization. A fire department is no different from any other group in that it takes talented, knowledgeable and dedicated people to accomplish the mission. It also takes caring, talented, and concerned leadership which can stand the test of stressful situations, or at least that's what I have witnessed over the past 47 years since I graduated from the U.S. Air Force Fire School at Chanhute Air Force Base in Illinois on the day before Thanksgiving in 1966. I hope you can see why I get a bit sentimental at this time of the year.

Organizational effectiveness also demands loyalty by all members to a shared vision. Many times during my training sessions, I have asked people to think about those traits which they believe that their favorite leaders have possessed. I have often asked my learners why it was that people would follow Old Chief What's His Name to the very bowels of hell? In many cases the answer was simple. People will

say they just did not want to disappoint that leader, because he was always there for them. He or she cared about me. That's pretty touchy-feely, isn't it?

One of my favorite leaders comes from my days as an Air Force firefighter when I served in the Philippine Islands. The year was 1968, and the man to whom I make reference had been a master sergeant since World War II. Chief Master Sergeant Grant was the epitome of tough. Really tough! However, he was also eminently fair, it that he was tough on everyone, including he himself. However, only he could be tough on the guys. Heaven help the poor person who tried to get us. Sergeant Grant would not allow anyone to mess with us. More than that, our squadron commander, Colonel Moore, felt the same way about his fire department.

I can still remember the time when we royally flubbed up on a live-fire drill for visiting Filipino dignitaries. It was one of the most dreadful training sessions of which it was my misfortune ever to have attended. I can recall that higher levels of command in the region called for our heads on a platter, but Sergeant Grant would have none of it. We were his guys and nobody was going to mess with us.

He assured Colonel Moore, our squadron commander, that we would all learn the error of our ways. And learn we did. We had pit fires coming out of our ears. We fought pit fires during the day, during the evening, and even on Sundays. We groused and grumbled but by the end of that two-week period of retraining we could sure put out some fire. When next we had a demonstration for those dignitaries, we did very well indeed. And boy, did Sergeant Grant tell the world about what a fine body of men the members of his fire department were.

I do not believe that at the time I truly appreciated the significance of what had transpired. Now that I reflect upon it, the truth of the lesson is self evident indeed. Somebody wanted to hurt his boys, and Sergeant Grant would have none of that. If tough love ever came into my life, our time in the Philippines was it. He and our Squadron Commander, Colonel Moore, shared that trait. As a matter of fact, I would go so far as to call it a belief.

They were both gruff, tough old-line warriors of a breed rarely seen anymore. If anything bad were to befall their troops, they took it personally. And if justice was required, they would be the people to administer it. Conversely, if you ran into a problem they would go to the extreme to take care of you.

Let me now ask you to ponder a very important point at this time. What commodity did we young airmen use to repay these rugged chieftains? Loyalty is the answer my friends. Loyalty to both our fire department and its leaders was quite strong. And our loyalty to both Chief Master Sergeant Grant and Colonel Moore ran deep and wide. Let me ask you a crucial question. Can you say as much for your department?

One thing that five decades of experience gives a person is perspective. When you have seen things go well, it qualifies you to speak about what you see when things are bad. And as we work our way through the early stages of the 21st Century, it is my sad duty to note that loyalty, as a concept and practice, seems to be on the wane. I see a world where the selfish, one-way street type of leader seems to have taken control. This is not a good thing.

It seems to me that far too many fire chiefs and upper-level officers have lost sight of what and who really matters in their departments. Add to this the dollar problems far too many of us are facing thanks to the boobs and bean-counters in the front office and you can see that we have the recipe for organizational chaos all around us.

People will labor mightily for people they believe care for them. And therein lies the secret to building loyalty. As officers and chiefs you must take an active part in your organization. You must move among the members and learn who they are and what they want out of life. Far too many chiefs, both career and volunteer, build



Image courtesy of Harry Carter

tall towers. They then ascend those towers and hide from their followers. And when you try to pay a call on the lofty heights of headquarters, you are frequently met with a cauldron of boiling oil. And that does real wonders for building loyalty among troops.

A great way to display loyalty is to share in the hardships of your people. On a cold night, don't leave the fire early and turn command over to a subordinate. There's a time and place to delegate, and cold, dark nights are not the time to begin. And if cuts are to be made in the annual budget, be sure that everyone shares. Let me also stress that you must never cut the training budget for your troops, entertain layoffs, and then head off to the annual fire chief's conference, golf clubs in hand.

What I am really saying here is that you must treat your troops as you, yourself, would like to be treated. Now isn't that a simple premise for building loyalty in your people? But it really is just that simple. Hmm... That sounds like a rule to me: the “Golden Rule” my friends.

No matter how complex and technically oriented the world becomes there is one constant which remains: people. Remember that your people will always use whatever technology is required to get a job done. However, it is the people who feel appreciated that will give a much better account of themselves when the chips are down. You will have a fire department where loyalty and hard work are the norm – a fire

**▲ Father and daughter clearly demonstrating inter-generational loyalty being passed on.**

department in which people do a dirty and dangerous job with smiles on their faces.

There are many people who have been loyal and supportive of all my labors throughout the years of my long and varied career. Sadly a great number of them are no longer with us. I have come to believe that I pay them the greatest thank you of all by passing along what they taught me as a young pup, college-educated, pain-in-the-butt, snot-nosed kid who was part of the new generation coming into take over their well-ordered world. Please consider doing this as you move through life in your fire department.

Loyalty cannot be bought. Loyalty cannot be sold. Loyalty cannot be demanded. It must be earned each and every day of the week when you come to work with the people of your fire department. Please remember that no fire chief was ever born with a white shirt and a gold badge. It is my wife of four decades standing, who delivered babies at the local hospital for two of those decades, who assures me of that fact. Take care of the troops and they will surely take care of you and your fire department.

**➡ For more information, go to [www.harrycarter.com](http://www.harrycarter.com)**



# Are F3 Foams an alternative to C6 AFFFs?

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**"SEAC considers that fluorine-free foams can be taken into account on a long-term basis but cannot be relied on for the coming years for such a critical use."**

Committee for Socio-economic Analysis (SEAC), Draft Opinion, on an Annex XV dossier proposing restriction on PFOA, its salts and PFOA-related substances, 10 September 2015, p14.

## Firefighting foam concentrates – the constant evolution: Part 2

The foam concentrate is a mixture of different raw materials such as solvents, salts, corrosion inhibitors and mainly surfactants. In case of synthetic products, there are two types of surfactants: hydrocarbon chain, which are primarily responsible of foaming capacity and foam stabilization, and fluorinated, in which part of the hydrogen chain atoms are replaced by fluorine atoms. The fluorinated surfactants are the key component in AFFF agents because they bring to foams repellence and resistance to hydrocarbons. They add also the ability to form an aqueous film of only a few microns on hydrocarbons.



**Javier Castro**

Javier Castro has been in the fire business from 2001. He has led all R&D activities on firefighting foam concentrates for Auxquimia, from AFFFs to Fluorine free over more than 15 years. Over this period of time he has developed some special products designed for very specific applications. He has been directly involved not only in product development, but very active on technical consultancy, always very close to end user's needs. Mr. Castro holds a chemical Engineer Degree from Oviedo University and he has been deeply trained over his career on QHSE, Finance and Management amongst others.

### 1. Environmental Regulations

Fluorinated surfactants can be manufactured by two processes, electro fluorination or telomerization. By using the first process, which is not longer used, it is generated products derived from PFOS (perfluorooctyl sulfonate), whose use in Europe is limited to proportions smaller than 0.005% by weight of finished products, according to European Directive 2006/122/EC. In the case of fluorinated surfactants produced by telomerization process, there is no specific regulation and are currently used as raw materials for AFFF agents manufacturing. Therefore, it is important to clarify that not all AFFF products are banned, but only those made with a specific type of fluorinated components.

Other fluorinated product which is subject to a special control by environmental authorities is PFOA (perfluorooctanoic acid). Although PFOA is not prohibited, nor it is a raw material to be used directly in foam manufacturing, there is a risk that the degradation of some fluorinated products generates this acid. The voluntary program from EPA "2010/2015 PFOA Stewardship Program," in which are involved the leading manufacturers of fluorinated products, aims to reduce fluorinated surfactants with chains of 8 atoms or more atoms mainly to chains of 6 carbon atoms (C6) before 2015. This way, it can be assured that any component degradation will not generate PFOA, since PFOA is a product with an organic chain of 8 carbons (C8).

During the last year, some proposals about regulation of PFOA levels has been proposed by different government; still not a clear desition since there is a lot of discrepancies about the achievable level that "makes happy" all the parties involved.

Apart from these international prohibitions and regulations, some countries are restricting also the use of any organohalogen components if they are likely to arrive ultimately to open waters, forcing many facilities to look for alternative solutions to AFFF agents, mainly in products without fluorine, which affects the performance considerably.

### 2. Fuels

Nowadays there is a growing amount of polar additives used in the composition of gasoline. The hydrocarbons can be extinguished with certain foams by violent application but polar solvents dissolve the foam when applied directly over the fuel. The mixture of hydrocarbons and polar liquids is an issue that should be considered by users because depending on the type and quality of foam the foam application techniques may be different.

Ethanol has been in recent times a fuel which demand has grown strongly, both for direct use or as an additive in gasoline. Nowadays the size of storage tanks containing this fuel is increasing. Ethanol must be treated as a polar liquid at the time of designing the fire fighting installation. The problem being when increasing the size of the tanks is to extinguish with portable systems (monitors), normally

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Image courtesy of AUXQUIMA S.A.U.

when there is a failure in the fixed fire fighting installation (frequent situation in case of explosion) since the direct application on the fuel is not possible.

The LNG (Liquefied Natural Gas) is another fuel that has gained importance in recent years, with large tonnages of LNG stored and transported by sea worldwide. Until now, protection of bunds of LNG is performed using high expansion systems, although some recent trials suggest that low expansion systems can be as effective with high performance foams.

### 3. Foam Concentrates

Due to the many changes in regulations, raw materials and fuels, the manufactures of foam concentrates have developed or modified their products to adapt them both legally and operationally to the market demands.

◀ **Concern to protect the environment lead manufacturers to develop more biodegradable concentrates.**

Both the new AFFF agents, whose fluorinated surfactants are mainly C6, and the foams known as Fluorine Free (3F) have been lately the innovations and main lines of development for several manufacturers. The development of more concentrated products is also a trend in the market, in which products of 1% are very common in the petrochemical industry, far from the traditional 6%. Currently, there are on the market AFFF and AR-AFFF that can be dosed at 0.5%. The logistic advantages of these type of products in the case of large foam demands are evident with respect to traditional 3% and 6%.

Another trend is the increasing market demand for synthetic-based products (AFFF and AR-AFFF) compared to traditional protein (FP, FFFP and FFFP-AR). The best firefighting performance, better burn back resistance along with no-degradation over time are the key to success.

Fluorine Free foams have increased their popularity because of environmental restrictions in some countries. The foams without fluorinated components have existed for many years in the market (protein, multi expansion foams, Class A forest retardants, etc..) although it is also true that in the last decade synthetic fluorine products have been developed for Fire Fighting Class B, with the goal of being valid alternative to AFFF agents, but with less environmental impact. Until the appearance of this new generation of products without fluor, the forceful application of foams was only effective if AFFF products were used. However, some new Fluorine Free are also able to be used directly on hydrocarbons, although its behaviour and efficiency is still far from AFFF performance, especially when it is used with non-aspirating nozzles.

Despite of the significant progress reached in the development of this product range, still have some limitations and AFFF or FFFP foams are still not ready to be replaced without serious evaluation. Before replacing an AFFF or FFFP by a Fluorine Free foam, it is necessary to check if the new solution have the same certifications and ratings than the existing product. It is highly recommended to carry out a comparative fire testing with both products, evaluating the effectiveness of both in different applications, with the available resources in each case (proportioning, nozzles, etc..) and avoiding a simple "paper" comparison based on the documentation of the products.

### 4. Fire-fighting systems

The traditional proportioning systems are based on mechanical principles, designed for fixed working conditions (flow, pressures, etc.). This is the case of Venturi type inductors, membrane tanks, systems around the pump, etc. In addition to its low flexibility in terms of flow rates and proportion rates, they are not particularly precise in the proportioning. For this reason it is not recommended to use with high concentrated foam concentrates (less than 1%), where small error in the injected amount of product can represent a significant error in the proportion rate, which can generate consequences in efficiency, autonomy and economy.

Although foam concentrates (0.1-1%) have been traditionally used in Class

A fires (solids), new developments have also allowed the use of AFFF and AR-AFFF products with at very low dosage rates (0.5%). In order to use these products with accuracy in the proportioning, it is strongly recommended the use of electronically controlled proportioning systems. A flowmeter is installed in the water line and this information is sent to a control unit, which controls the foam injection system, accurately adjusting the amount of foam required for each water flow. These equipment are very common in fire trucks, but can also be used in forest systems, fixed installations, etc.

Another important development in the sector has been the development and implementation of Compressed Air Foam Systems (CAFS), which are based on the

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injection of compressed air into the foam solution (water + foam), producing foam with uniform fine bubbles and excellent adhesion and cooling capacity. Since the foam is produced by the injection of compressed air is not necessary any restriction for the air intake at the nozzle, resulting in a large range with excellent foam quality. Better drainage times, faster extinctions, better burn back resistance, less water consumption, etc. are some of the characteristics of CAF systems.

#### **Do we have to renew our stock of foam concentrate?**

From the point of view of a user that has foam concentrates stored in his warehouse, it can be raised the question if it is convenient to renew his stock of foam in view of the many changes previously discussed. To carry out this evaluation it is necessary to ask the following questions:

#### **Are we sure that our AFFF product is not formulated with PFOS?**

If our stock of AFFF product is previous to 2000, it is necessary to ensure that it does not contain PFOS by carrying out a specific analysis of the fluorine compounds contained.

#### **Does our product keep its characteristics and properties?**

##### **¿Have we done any analysis of the product since the purchase?**

Some foam concentrates experience a reduction on its effectiveness over time. It is recommended to verify periodically the quality of the product.

#### **Is our product certified according to standard EN-1568:2008 with the required classification?**

The standard EN-1568-3:2008 is the reference standard in Europe and we must know the classification of our product both with hydrocarbons (EN-1568-3:2008) and with polar liquids (EN-1568-4:2008). Depending on the classification of the product, we must evaluate if our firefighting equipment is suitable to be used with the existing foam concentrate.

#### **Does our product comply with other standards that can be important for our risks?**

If the foam concentrate is going to be used for fires in storage tanks, airports, etc. where there are specific regulations, it is recommended to confirm the compliance with these regulations by carrying out the corresponding tests.

◀ Electronic proportioning systems and CAFs allow to use highly concentrated products.

#### **Is the proportion rate the most adequate for our interests?**

The foam concentrates has progressed towards a reduction in the proportion rate, from the traditional products 6% to most modern ones 0.5%. In some cases the foam concentrates have only a single proportioning rate for hydrocarbons and polar solvents (1%, 3% and 6%), but in other cases the proportioning rate change depending on the fuel (0.5x1, 1x3 and 3x6). If it is necessary to protect both against hydrocarbon and polar solvents fires, the most convenient option is to have a product with one only dosage rate to avoid mistakes during firefighting operations and especially in the case of a fire brigade whose type of emergencies are very different.

#### **Is our product effective with all the fuels and risks we have to attend?**

Most of the standards use heptane as reference fuel for hydrocarbons fires, and acetone and isopropyl alcohol for polar liquids fires. Moreover, they generally use aspirating nozzles (excepting standard UL-162). Thus, it is possible to compare the effectiveness of different products in constant conditions. It is likely that the real fires are with other fuels such as diesel oil, gasoline, kerosene, ethanol, methanol, etc. or even a mixture of these fuels, hence we must be sure that our foam concentrate is capable of extinguishing and protect effectively against all types of fuel with the firefighting equipment available.

#### **Is it suitable our foam concentrate to be used with our firefighting equipment?**

We must know what is the real performance of our foam concentrate when operates together with our firefighting equipment. Firstly, we must verify that the proportioning system is suitable to be used with our foam concentrate, and especially if the product is pseudoplastic such as AFFF-AR or Fluorine Free products, due to their high viscosity at low temperatures. It is also important to know the foaming capacity of our foam generators (low, medium or high expansion).

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# Hazards of confined space

Fatalities attributed to confined space working are still significant. There are many studies and statistics available. According to data collected there are approximately 90 fatalities every year in the US and 15 in the UK. Approximately 40% to 60% of those fatalities involve attempted rescues. Confined space fatalities can be prevented by establishing an effective confined space system and following procedures.



**Martin Matchett**

Previously a UK firefighter with the Grampian Fire and Rescue Service for 16 years until an accident at work and medical discharge forced a career change. On passing his NEBOSH Diploma he moved into the field of Health & Safety, Firefighting and Emergency Response training. This led to roles in Emergency Response training both in UK and Internationally. Now working at the Fire Training Group, Aberdeen International Airport as Operations Manager looking after compliance.

**S**ome of the hazards attributed to confined space atmospheres are, flammable gases, oxygen deficiency, oxygen enrichment and combustible dusts. But there are also other hazards that may be present, such as electrical/mechanical equipment, visibility, noise, temperature and claustrophobia.

Confined spaces are hazardous and dangerous. It is important that we take reasonable precautions in or around them, which includes rescue operations.

Many employers and employees fail to recognise the characteristics of

confined spaces, which affects the decision making process and the failure to impose proper safeguards.

Employers need to recognise confined spaces and provide the training/competencies required for employees to evaluate the presence and hazards of confined spaces.

Confined spaces can be defined as

▼ **Confined Space training simulator** with varying type and size of entry points, providing both vertical and horizontal travel.



any place, such as a chamber, tank, vat, silo, pit, trench, pipe, sewer, flue, well or other similar space in which, by the nature of its enclosure, there are risks identified within the enclosed space.

Employees need to be competent in confined space operations and trained according to the risk. Managers/supervisors require competence in formulating risk assessments, method statements, safe systems of work and issuing of permits.

Training should also include the requirement for emergency arrangements to be in place, which includes the rescue and first aid of casualties.

Legislation and regulation differs by country, but provides an approved code of practice and guidance for those who work or control work in confined spaces.

## Reason

In the UK there are legislative requirements that employers should adhere to such as the "Health and Safety at Work Act 1974" where they are required to provide information, instruction, training and supervision to ensure the health and safety at work of employees. This shall include specific training for working in confined space and an awareness of the regulations covering the need to enter, understanding of the work to be undertaken, the hazards, and the necessary precautions; understanding of safe systems of work, and 'permits-to-work'; along with an understanding of emergencies and emergency arrangements

## The confined space regulations 1997

The regulation cover a wide range of subject matter and guidance for employers to follow, some of these include:

- Definition and examples of confined space
- Associated hazards
- Provide risk assessments that identify the hazards and risk to workers, and the control measures required
- Preventing the need for entry unless it is not reasonably practicable to achieve the purpose without entering
- Safe working in confined spaces and the precautions that should be included in the safe system of work



Image courtesy of Martin Matchett

- Main elements to be considered in a safe system of work, and procedures to be adopted for a 'permit-to-work'
- Emergency procedures and arrangements, types and nature of the rescue, recovery of casualties from a confined space and the provisions to support emergency arrangements
- Type of plant and equipment for use in confined spaces
- Size and openings to enable safe access to and egress from confined spaces
- Respiratory protective equipment should be suitable for the purpose
- Other equipment may include ropes, harnesses, fall arrest gear, lifelines, first aid equipment, PPE etc.
- Maintenance of equipment to ensure that it is 'maintained in an efficient state, in efficient order and in good repair'
- Examination and testing as per manufacturer or supplier's instructions also the frequency and type of examination
- Training we should look at in more detail as this is the important factor to reduce fatalities with in confined space working

▲ **Tunnel/Shaft simulation 600mm diameter provides sensory perceptions.**

## Training

It is therefore important that training meets the requirements of the regulations and legislation. It is not simply a case of sending employees on a "Confined Space Course" to tick a so called box. It is the quality and content of the training course that is paramount in ensuring that employees are deemed competent.

Regulations give guidance on training and what should be taken into account i.e. practical use of equipment and safety features, identification of defects and, where appropriate, it should involve demonstrations and practical exercises. Employees should be familiar with the equipment and procedure that their company employs before working in confined spaces.

Where applicable employees who may be involved in any emergency rescue should be trained for that purpose, dependent on their role or responsibility. This type of training should include: use of rescue equipment, emergency procedures, rescue techniques and exercise, shut





▲ Simulated props for task based scenarios, lock out and tag out isolations.

◀ Vertical ladder and hatch access

Detection/Testing and Monitoring Equipment, Ventilation Equipment, Chemical Suits, Tripods, Fall arrest block/ winch, Harnesses, Ropes/Slings/Lines, Lamps/Torches, First Aid & Rescue Equipment and casualty simulators. As you can imagine this list is not exhaustive, but highlights the equipment that may be required to provide quality training for employees to be assessed as competent in working with confined spaces.

It is also important that training staff are suitably qualified, i.e. hold current instructional and assessing qualifications, have relevant experienced and technical knowledge in confined space operations.

So it is important that employers ensure that training providers can provide a selection if not all of the above, dependant on the course requirements.

### Conclusions

We know there is a risk to workers in confined spaces and fatalities are still occurring. We have regulations that highlight controls measures and Safe Systems of Works that protect workers

Employers have a responsibility to ensure that they provide all employees with quality training and instruction relevant to their role and responsibilities in confined space operations.

➔ For more information, go to [www.thefiretraininggroup.com](http://www.thefiretraininggroup.com)

down of process plant procedures, First Aid and equipment including regular and periodic exercising.

Courses should meet the occupational standards of industry with clear defined learning outcomes and the knowledge criteria to meet those learning outcomes.

To ensure that employees are competent in confined space operations, the assessment processes should be both practical observation and written test to confirm understanding of knowledge.

Training should be on-going with a natural progression through confined space training dependent on the risk involved and the role in which the individual partakes. The level of the course and the assessments should reflect this.

Standardisation of courses for employees will ensure that there is consistency in communication, training and assessment.

Employers should ensure that the training they provide staff with is suitable and sufficient for the tasks in hand. CPD's (Continual Professional Development) records should be set up and recorded to demonstrate the employee's competence and record of training. As I have mentioned earlier with on-going training it is also important that refresher training is undertaken to ensure that skills and knowledge are refreshed, it also provides a means to update employees with any change or revision in regulatory standards.

### Training Facilities

Employers should ensure that training providers have the minimum of equipment and facilities to meet standards required for the qualification being taught. For example a Confined Space "Emergency Rescue" course require the appropriate equipment for the Risk and the Emergency Rescue.

Although the equipment and facilities will be generic, they must still be suitable and meet any design specification required.

The facilities must be able to provide simulated confined spaces covering a range of scenarios, including vertical entry and travel, horizontal entry and travel, various access openings, some with ability to demonstrate and practice lifting/lowering. As well as reflecting types of entry and travel distances the simulator should also be capable of simulating sensory perceptions (reduced visibility, noise/ hearing, moving in restricted space).

PPE must meet regulatory standards and be appropriate for the course but should include: Coveralls, Gloves, Footwear, and Head Protection.

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Other equipment should include

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# Make the commitment to be a heart-healthy firefighter

Most firefighters, emergency medical personnel, and rescue providers pride themselves on being ready for the next call. They participate in many hours of training, build up on-the-job experience in all kinds of emergencies, and work to prepare their department and community for disasters. But what many forget to take into consideration is whether their bodies are truly ready for the rigors of emergency response. How many responders regularly take stock of their own health to make sure they are physically prepared for the challenges that lie ahead?



**Kevin D. Quinn**

Kevin D. Quinn serves as the Chair of the National Volunteer Fire Council. A member of the fire service since 1976, he recently retired as a Deputy Chief of the Union Fire District in South Kingstown, RI, and has returned to where he began – actively responding to fires and alarms with his original Station #3 of the Union Fire District.

## Why heart health is a concern for firefighters

Firefighters routinely face extreme environments that may include intense heat and exposure to toxins. Add to that the high stress levels of response, significant exertion, and heavy gear, and you have conditions that are tough even for the healthiest individuals. Because of the nature of being an emergency responder, there are also factors such as interrupted sleep patterns, going from long periods of down time to sudden periods of high adrenaline and stress, and, especially for volunteers, lack of spare time that can lead to unhealthy habits such as eating poorly or not exercising.

Year after year, the number one cause of line-of-duty deaths for firefighters in the United States is heart attack. According to the U.S. Fire Administration, there were 993 on-duty firefighter fatalities in the U.S. between 2006 and 2015. Of these, 530 deaths were classified as being the result of stress/overexertion, with 479 of the deaths in this category specifically attributed to heart attack. That means

▼ NVFC Chair and volunteer firefighter Kevin D. Quinn participated in a firefighter physical in July as part of a visit to the Cherryville Fire Department in North Carolina. The physical led to the discovery of a heart condition Quinn was previously unaware of.



48 percent of on-duty firefighter deaths in this 10 year period were due to heart attack – more than any other cause of death.

Because of this trend, much research has been conducted in the U.S. to study the issue of heart disease among firefighters. Here are some of the findings:

A 2007 study published in the New England Journal of Medicine found that emergency firefighting duties were associated with a risk of death from coronary heart disease that was markedly higher than the risk associated with nonemergency duties. Fire suppression was associated with the highest risk.

In 2013, a study in the Obesity Journal found that weight was a significant predictor of incident musculoskeletal injury, with obese firefighters 5.2 times more likely to experience this type of injury than firefighters who fell into a normal weight range. The study concluded that focusing on firefighters' body composition, nutrition, and fitness can decrease risk for injury.

A 2014 study by the Centers for Disease Control and Prevention reported that 70 percent of firefighters are overweight or obese. Similarly, a 2011 study by the National Volunteer Fire Council (NVFC) reported that the rates of overweight and obese individuals in the fire service are higher than those found in the general public. Obesity threatens firefighter health and safety and can lead to job-related disability, high blood pressure, and heart disease.

## What You Can Do

The key to making sure a firefighter doesn't suffer death or disability due to a heart attack or other heart related illnesses is prevention. Identifying and managing risk factors, early detection of existing problems, and making lifestyle changes to lessen risks are all ways to protect a firefighter from tragic outcomes.

Some responsibility should be taken at the department level. Leadership should embrace healthy behaviors among personnel, such as having healthy foods available at the station, implementing a smoking ban on department property, and establishing a health and fitness program. Identify a member of the department who is health-minded to lead these efforts, with full support from leadership. This person will serve as the



Image courtesy of the NVFC

health and wellness advocate and will have the task of motivating the rest of the personnel as well as serve as the point of contact for implementing health and wellness initiatives.

In addition, functional fitness can be incorporated into department trainings. Functional fitness is more than just exercise – it is exercise targeting the muscles that are used during emergency response activities and using actions that simulate these activities. While exercise overall is important, firefighters can also be considered a type of athlete that needs to train their bodies to be prepared specifically for the types of actions they need to take while responding to an emergency, such as pulling hose, climbing ladders, and carrying or dragging victims to safety. Develop fitness circuits during training activities that physically prepare firefighters for the rigors of emergency response.

Firefighters should also fit in exercise when they can. Do not assume you are getting enough exercise simply because you are a firefighter or emergency responder. Fitness needs to be ongoing – you need to make the effort to ensure your body is ready for the call. Many exercises can be done during free time while on duty and using items found at the station. Also consider making fitness a group effort and challenge the entire team to focus on getting healthy; this creates a more supportive atmosphere, and monthly fitness challenges can be a great motivator. Fitness activities can also carry over to home time – take walks

▲ NVFC Chair Kevin D. Quinn and staff member Dave Finger met with Cherryville Fire Chief and NVFC board member Jeff Cash and physicians in July to discuss Cherryville Fire Department's annual firefighter physicals program.

or hikes with family members, organize sports games with friends, and find other ways to stay active even when away from the station.

When developing a department health and wellness program, consider using National Fire Protection Association (NFPA) 1500, Standard on Fire Department and Occupational Safety and Health Programs, for guidance. The NVFC also has resources for developing health and wellness programs, as well as gaining sponsors for the program if any costs are involved, such as obtaining fitness equipment. These resources, along with example functional fitness exercises and training circuits, can be found on the NVFC Heart-Healthy Firefighter Program web site at [www.healthy-firefighter.org](http://www.healthy-firefighter.org).

Nutrition is also a big factor in staying heart healthy. Make healthier food choices to prevent negative impacts from what you ingest. If eating on the go, choose a healthier restaurant or menu option. Opt for snacks such as fruit, nuts, and popcorn instead of those high in sugar, fat, or sodium. Select lean meats and bake, broil, or grill instead of frying. Limit your intake of added sugars and eliminate sugar-sweetened beverages such as soda and sports drinks.





Image courtesy of Kevin D. Quinn

Thanks to a firefighter physical, NVFC Chair and volunteer firefighter Kevin D. Quinn learned about a heart condition and was able to receive the bypass surgery he needed to prevent a heart attack.

life to the early detection I received as part of the firefighter physical.

The NVFC supports medical assessments for all firefighters, although the organization realizes that financial and other barriers may affect what kind of program a department implements. NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments, outlines a complete assessment program for members of the fire and emergency services. The U.S. Department of Transportation provides medical assessment guidelines designed to confirm someone is healthy enough to perform the job of commercial motor vehicle driver. Many departments implement their own physicals program based on the specific job duties and expectations of the agency. Individuals may also utilize annual physicals from their personal physicians to detect illness or risk factors, although this type of evaluation does not specifically assess the ability of a person to perform the job duties of a firefighter.

In addition to identifying heart disease and related risk factors, annual physicals can also provide early identification of other illnesses firefighters are at risk for, such as cancer and diabetes. Early detection of illnesses can mean the difference between positive and negative outcomes.

#### A stronger you means a stronger crew

Reducing line-of-duty injuries and deaths should be a top priority for all emergency response organizations. However, much of the responsibility lies with the individual. I strongly encourage you to make the lifestyle changes that will help strengthen your heart and better prepare you for the job functions you perform as a firefighter. Your family, your crew, and your community depend on you being healthy and ready to respond. Make sure you are there for them when they need you. Being heart strong will make you a better firefighter, and a better you means a better crew.

For more information, go to [www.healthy-firefighter.org](http://www.healthy-firefighter.org)

#### Early Detection is Key

Early detection of potential health problems is a big factor in protecting firefighters and emergency responders. Heart disease risk factors such as high cholesterol, high blood pressure, diabetes, and others can be discovered during routine health evaluations and subsequently managed. Tell your healthcare provider that you are an emergency responder so they can better advise you based on your specific situation.

I can personally attest to why an annual medical evaluation is critical for early detection. I strive to be healthy by eating right and exercising, yet I was completely unaware that I had an underlying heart

condition. I had no symptoms and no reason to believe I had heart disease. In July, I traveled to a fire department in North Carolina to learn about their annual physicals program and how other departments may be able to adopt a similar program. While there, I received a medical evaluation, and the results led to more tests that uncovered my heart condition.

Thanks to this early detection, I was able to get the heart bypass surgery I needed to prevent a heart attack. Without this surgery, I could have easily suffered a heart attack or other impairment, perhaps while on the scene or performing my duties as a firefighter. This would have endangered not only me, but also those I serve with and potentially those I was trying to save. Thankfully, we'll never know what would have happened, but I truly believe I owe my



Image courtesy of Dan Kerrigan

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# How can communications technology improve emergency responses?

In the event of an emergency, effective communication is vital to ensure an organisation's timely response. Nick Hawkins, Managing Director of Everbridge EMEA, discusses how cloud-based communications technology can help organisations keep their employees safe and blue-light services improve their emergency responses.



**Nick Hawkins**

Nick Hawkins joined Everbridge as Managing Director EMEA in April 2015. Nick is an experienced business leader and has managed sales and service teams within the Services, IT and Communications industries for more than 25 years. Nick has extensive experience in the security industry and spent more than 10 years in the Metropolitan Police.

**T**he shocking events of September 11th 2001 highlighted the communication challenges that can occur during emergencies. Contact paths were affected for both workers in the Twin Towers and the emergency staff trying to rescue them. As the initial shock of the deliberate act of terrorism subsided, a new threat emerged as fire raged through the two buildings. In a time of extreme shock and panic, confusion reigned with people first being told to leave the buildings then later being advised to stay.

Following the events of 9/11, critical communications platforms have been developed to oversee and manage

▼ Everbridge's mass notifications function enables control rooms to send out targeted alerts to response teams to inform them of an emergency.

emergency communications, harnessing the power of the latest cloud-based technology to locate, communicate and help protect people in crisis or emergency situations, including the outbreak of fire. These platforms can be deployed by employers to get a better understanding of when their employees are in danger or by emergency services to more effectively co-ordinate responses.

## Protecting employees

In the event of a fire breaking out in an organisation's building, a critical communications platform can significantly help improve evacuation processes and the deployment of resources to co-ordinate and manage the emergency.

Once a fire has been detected, an emergency notification can be sent in seconds to alert employees of the immediate danger. These notifications



Image courtesy of Nick Hawkins



▲ The Everbridge unified critical communications platform keeps people safe and businesses running.

can keep staff up-to-date on the fast-changing situation and make them aware of safe evacuation routes.

No communication path is 100% reliable, 100% of the time – Wi-Fi fails; mobile networks go offline and apps crash – relying on one contact path could be a costly risk. For this reason, the most effective critical communications platforms have multi-modal functionality. This is the ability to send out notifications using many different communications channels, including SMS, email, VoIP calls, social media alerts and app notifications amongst many others. This ensures messages get through to the right people at the right time.

The most effective systems allow for two-way communication between an organisation and its employees, meaning staff are able to instantly respond to an emergency notification and make employers aware of their status. The platforms two-way polling feature allows recipients to respond with the push of a button, letting an organisation know that they are 'safe' or 'not safe'. By building a clear picture of an incident within minutes, organisations can prioritise those in danger.

Crisis communications platforms – such as the Everbridge platform –

automate the traditionally time-intensive communication process, improving an organisation's emergency response times. The persistent sending of notifications via multi-modal techniques provides employees and civilians with the peace of mind that their safety is paramount.

## Importance of location alerting

Dynamic location tracking and alerting can be useful for safeguarding the well-being of employees. Many organisations integrate critical communication platforms with physical security systems to identify, communicate with and account for people during disruptive events. By inputting data that organisations already have – such as Wi-Fi network points and building access information – the platform is able to interpret real-time geo-location data, even for people moving between locations and prioritise those most at risk.

Systems that enable employees to initiate communications have a much greater impact in protecting their safety in location-based emergencies. For instance, if an employee discovers a fire, panic button capabilities can prove extremely valuable. Everbridge's smartphone application has SOS alerting and panic button capabilities built-in, so employees can send a message directly to an organisation's security team. This automatically transmits the employee's location and begins sharing audio and video data via the user's smartphone, with just the push of a button.

## Protecting a mobile workforce

According to a 2015 report by Strategy Analytics, the global mobile workforce is expected to grow to more than 1.75 billion by 2020, accounting for almost half of the entire workforce worldwide. The effect of globalisation on business means employees are regularly travelling between locations, often to different cities and countries. As a consequence, keeping mobile workers safe from harm during emergencies is rising up the corporate agenda.

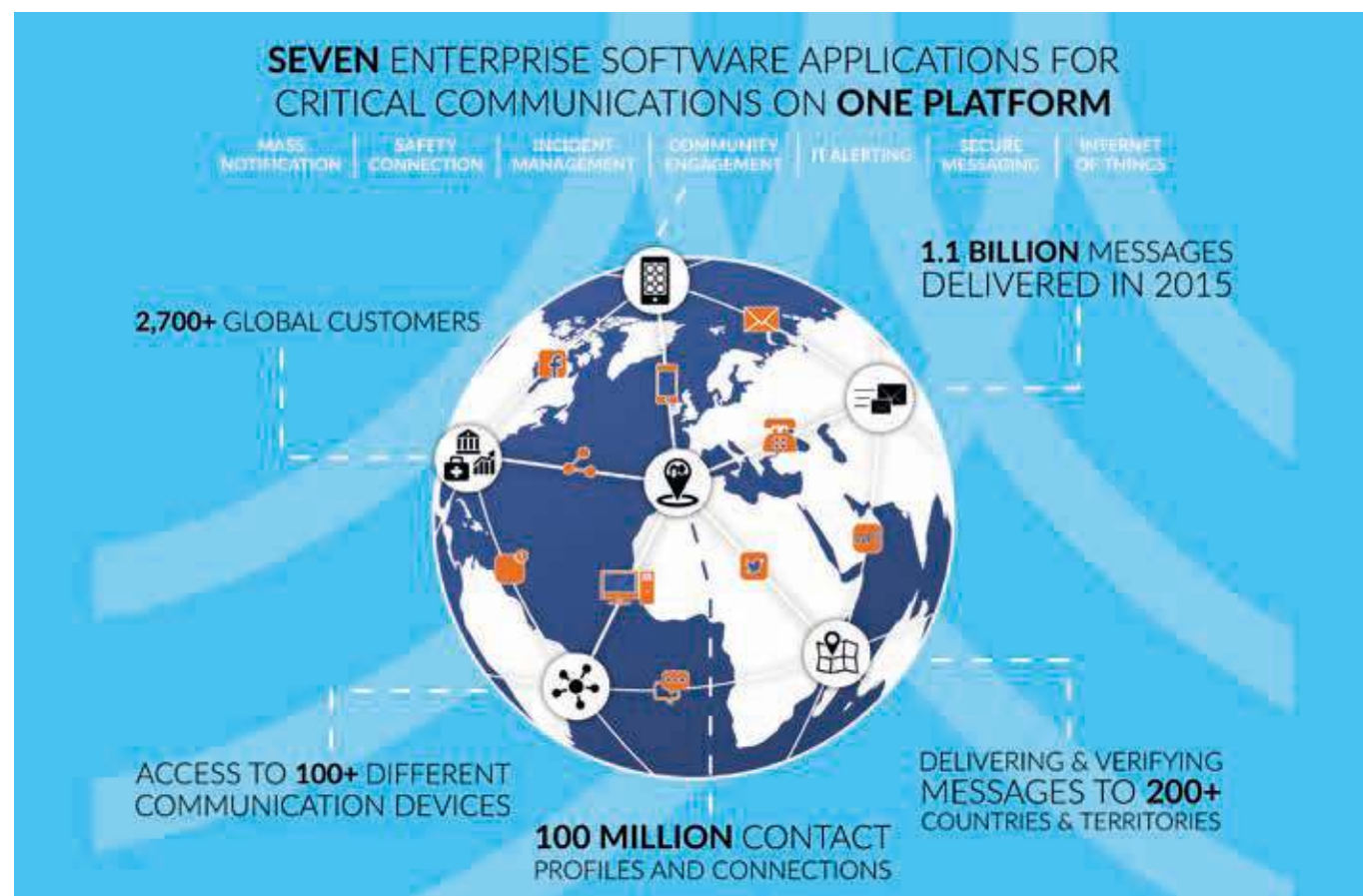
If an organisation had a sales team attending a conference in California when a large scale wildfire broke out, it would be able to send out a notification to alert them of the impending danger, receive their response and provide actions to guide them to safety. Communications platforms help automate and streamline emergency responses and enable organisations to prioritise the safety of its workforce.

## Benefits to an organisation

One important advantage for organisations that implement a critical communications platform is that it is a secure, cloud-based solution that operates independently from an internal network. If a severe fire damages hardware running a company's network, making standard communication difficult, an organisation using a critical communications platform knows it still has the ability to communicate quickly and efficiently with all staff.

Technology of this nature is also





extremely flexible to a user's needs, with organisations able to scale-up the platform to incorporate an infinite number of people and data-sets. It also allows organisations to build bespoke templates and workflows based on its specific requirements and processes. For an organisation of any size, having a multi-functional critical communications platform can aid effective everyday communications. For instance, the platform can be used to keep employees aware of important safety information such as upcoming fire drills and changes to evacuation procedure or fire assembly points.

#### Supporting emergency services

For Fire and Rescue teams and other blue-light services, communications platforms can and are being used to improve emergency response. The mass notification function enables control rooms to send out targeted alerts to response teams to inform them of an emergency. Depending on the scale of the crisis, these can be sent out to both on-call and off-duty staff to gauge the availability of resources to resolve the incident.

Pre-templated responses enable incident management teams to quickly assess who is available to respond

to a crisis. For example, Guy's & St Thomas' NHS Foundation Trust uses a communications platform to send messages with the option to respond with "on site and available"; "off site and available"; "off site and not available". Using this approach the Trust has been able to generate 80% responses within minutes, giving it a clearer picture of the resources it has at its disposal.

Beyond the more effective co-ordination of emergency responses, critical communications platforms play an important role in public safety. During a major emergency, such as a wildfire spreading to a densely populated area (e.g. Californian wildfires, Summer 2016) or an earthquake, notifications can also be sent to residents to warn them that they need to evacuate the area and by which routes.

By utilising the location capabilities of the platform, incident control teams are able to use geo-location data to track their on-call staff and provide estimated time of arrival (ETA) updates to other emergency services already at the scene. During a widespread and catastrophic disaster like the infamous 'Black Saturday' bushfires in Australia in 2009, this technology would have significantly helped co-ordinate the efforts of fire crews on the ground.

▲ Everbridge delivered more than 1.1 billion messages in 2015 to help protect citizens and businesses.

#### The future of emergency communications

With a rise in the number of critical events worldwide – such as natural disasters and acts of terror – it is more important than ever that emergency services and organisations of all sizes have the tools to be able to locate and communicate with employees and civilians, whatever the crisis and even when traditional routes of communication are unavailable.

In an emergency, every second counts. Organisations and emergency services cannot afford to waste time searching spread sheets and schedules to manually notify employees and on-call staff. Automated and reliable crisis communications platforms can make the difference between life and death.

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# Developing in-house training for CFB Suffield Fire Services

Canadian Forces Base (CFB) Suffield is located in Southeast Alberta, approximately 50 kilometres west of Medicine Hat, CFB Suffield has been the site of military training in the region since 1972 and is host to the largest military training area in Canada, conducting the largest live-fire training exercises in the country.



**Kelly Meyer**

**T**he Manoeuvre Training Area covers 1,588 square kilometres of a 2,700 square kilometre base. The mission of CFB Suffield is to provide a world class, sustainable Range and Training Area that enables the Canadian Armed Forces, Defence Research and Development Canada (DRDC) – Suffield Research Centre, the British Army Training Unit Suffield and other potential users to achieve their mandates through effective stewardship of all the Range Training Area, infrastructure and equipment. The base fire department provides 24hr coverage to support the mission of CFB Suffield.

Three years ago CFB Suffield Fire Services moved into a new 2,133m<sup>2</sup> fire station at Canadian Forces Base (CFB) Suffield. This was a very positive start to

the process of making positive change within our organization. Prior to making the move to the new station, myself and several members of our department discussed the potential to deliver in house courses that would meet the requirements of the National Defence Fire Services (NDFS) with regards to International Fire Service Accreditation Congress (IFSAC) or National Board of Fire Service Professional Qualifications (ProBoard) accredited certification. Now that we are in our new home with room for all of our vehicles and equipment, and the members being comfortable with their surroundings, it is time to push forward with improving our services. This is necessary in order to meet the fire prevention and emergency response needs of Canadian Forces Base (CFB) Suffield, British Army Training Unit Suffield (BATUS), Defence Research and Development Canada (DRDC) and other users of our Military Base.

After having discussions with Fire Services personnel, an action plan was developed to determine the way forward

▼ While using the Mobile Aircraft Fire Trainer (MAFT) to simulate a hard impact landing with breached fuel tanks, ARFF Trucks Red-6 and Red-8 moves into position to conduct firefighting operations.

Deputy Fire Chief Kelly Meyer started his career at CFB Suffield August 5th 2005. Part of his duties as Deputy Fire Chief, Kelly is in charge of operations and training for the department along with assisting the Fire Chief with the daily functions of the Department.







Image courtesy of Kelly Meyer

▲ After extinguishing all ground fires Red-8 continues to maintain a rescue path. Water is used for training operations instead of AFFF for environmental conservation.

for developing our training and certification program. The first step was to ensure we had qualified instructors to lead our training. In order for our own personnel to instruct courses for accredited certification they are required to first be certified to National Fire Protection Association (NFPA) 1041 Standard for Fire Services Instructor Professional Qualifications. They are also required to hold certification for the fire service discipline and level that we need them to provide instruction for. As an example, they are required to hold technician level certification for NFPA 1006 Vehicle and Machinery Rescue if they are going to provide instruction with accredited certification to the NFPA 1006 technician level. Fortunately, many of our Journeyman Firefighters already hold the certification requirements for Fire Service Instructors. Support and approval was obtained to fund the training required so that our instructors would have the certifications needed to deliver the in-house training to meet our organization's needs.

A commonly used saying with regards to training is that "If you don't use it, you lose it." This is very applicable within the Fire Service on many levels. When skills, knowledge and training are neglected, the ability to recall them when needed most is gone. By developing our instructors and giving them the ability to teach on a regular basis, they keep current with their

knowledge and skills while providing quality training to the members of their platoons. With journeymen firefighters who are qualified as instructors as a key component to our training and certification plan, the department now has the ability to deliver the training we need while also reducing training costs significantly.

After further discussions with the Fire Chief and our instructors, we selected a course which would allow us to adapt to the Base's needs for emergency response. It has been determined that our first in-house course that is completely facilitated by the department and our personnel will be the NFPA 1006 Rescuer Awareness. This course is ideal to get our feet wet. Having members certified in Rescuer Awareness also puts us in a good position for having the prerequisites to be able get our members certified as Confined Space Technicians, Vehicle/Machinery Technicians and Rope Rescue Technicians. In Alberta we have a reputable fire school that provides high quality training for firefighters. Therefore, two members of our Department were enrolled and attended the fire school in order to obtain NFPA 1006 Rescuer Awareness certification. These two members now have the certifications to provide the department members with the training they need. In Alberta the IFSAC and Proboard accreditation for fire service certifications is held by the Alberta Office of The Fire Commissioner (AOF). This allows the AOF to provide for client hosted training for the Rescuer Awareness course and many other fire service courses.

One of the requirements to run the NFPA 1006 Rescuer Awareness was to get our training facility inspected and approved by the Office of the Fire Commissioner. With assistance from Medicine Hat Fire Department's Chief Training Officer, we were able to complete the site inspection for the OFC. Any course we deliver will require a proctor and an evaluator for the practical skills evaluation and knowledge testing components of each course. We are able to utilize the Base Civilian Training Officer who can assist with the proctoring. For the practical evaluations we have another Canadian Forces Base north of us, CFB Wainwright, with certified fire instructors who have offered their assistance with evaluations when needed. Having a good working relationship with other Fire Departments and military bases allows us to assist each other to meet our training together. In December we will be running our first in-house course through the OFC to certify the members at CFB Suffield Fire Department with the NFPA 1006 Rescuer Awareness.

With a plan in place to obtain certifications in-house, we started to look at other training that could be done in house using our own equipment and utilizing the knowledge of our members in order to further reduce costs. Other opportunities for in-house training include Aircraft Rescue Firefighting recertification and S100-G which is Alberta's grassland firefighting course. The S100-G course is required for our department as well as the Canadian Range Control Field Operations Section (FOS) who is trained as Wildland firefighters and are responsible for extinguishing hundreds of grassland fires that occur in our military training area throughout the year. BATUS and DRDC also have personnel who require grassland firefighter training due to some of their personnel being assigned grassland firefighting duties. During the BATUS training season from May to October, there are a considerable number of fires caused by training exercises. In Southern Alberta, trees are very scarce and the terrain is quite flat with rolling hills. The grass on the training area usually gets quite thick and can grow up to two feet high before it dries out during the hot summer months. This creates a significant problem when a fire starts in the tall dry grass as all it needs is a little breeze to grow very quickly.

The Canadian Military Range Control





Images courtesy of Kelly Meyer

across Canada for a couple of days for the recertification course. If you are not familiar with Canada, CFB Suffield Alberta to the CFFCA at CFB Borden is 3096 km or 1935 Miles. With the cost of hotels, flights, meals and rental car the cost starts to add up. Our training plans were already in motion to develop in house training to obtain certifications so we start running in house annual ARFF re-certification courses as well. By contracting a Mobile Aircraft Fire Trainer (MAFT) through MAFT Canada near Edmonton we were able to complete the required training for all of our personnel. This allowed us to use our own vehicles and equipment and standard operating procedures to do a gap analysis. This will allow us to determine if our procedures are up to the standard for Aircraft Firefighting while providing significant cost savings by reducing annual recertification costs by approximately \$50,000. This allows us to better utilise training funds for other mandated certifications. On Oct 12th of this year we successfully completed our first in house recertification for all of our members and are now compliant for another year.

This journey has been a challenging one as we were faced with resistance and negativity due to some of our members being resistant to change. There were times I felt that this dream was turning in to a nightmare, but it is now clear that there is light at the end of the tunnel. After educating the members about the benefits of having in house certification courses we were able to get them on board. We now have subject matter experts on each platoon who are qualified in a variety of fire service disciplines and we are already beginning to see significant cost savings. We are also working to provide opportunities for local fire departments that we have mutual aid agreements to come and train with us to improve our ability to work effectively when we respond to emergency incidents together.

All the hard work, dedication and ambition from our members as well as the support from CFB Suffield and BATUS will ensure our training program meets the requirements for fire fighter certification while reducing the cost significantly.

**For more information, go to**  
[www.army-armee.forces.gc.ca/en/cfb-suffield/index.page](http://www.army-armee.forces.gc.ca/en/cfb-suffield/index.page)



▲ DFC Meyer explains the setup of the Decon line and the members roles as the decon team.

◀ Firefighters making final preparations prior to making entry to man the decon lines.

FOS personnel are on duty 24/7 to combat grassland fires when required. Due to our military training area being 1,588 square kilometers in size, BATUS personnel are often required to assist with combating fires until FOS arrives on scene. When these fires threaten infrastructure or are beyond the capability of FOS to control with their resources, Fire Services are dispatched to assist. Some Fire Services personnel are trained to instruct the S100-G course. We have delivered this course too more than 70 BATUS, FOS and DRDC personnel resulting in a cost saving of approximately \$70,000 this fiscal year when compared to the cost of the wildland firefighting course that instructors previously had to be contracted to instruct on our base.

CFB Suffield Fire Services personnel are all qualified to NFPA 1003 Airport Firefighter Professional Qualifications. BATUS has several types of helicopters they use for training here including Gazelles and Wildcats. At one time large fixed wing aircraft used to land at our airfield, but the runway is no longer used for this purpose. It is primarily used for helicopter operations and has

been used several times for emergency landings when privately owned aircraft have experienced an inflight emergency. Because of the requirement to provide Aircraft Rescue Fire Fighting (ARFF) services to support flight operations, we also have to re-certify our personnel annual to STANAG 7145 Minimum Core Competency Levels and Proficiency of Skills for NATO Fire Fighters.

Since we are part of the National Defence Fire Service, we have the opportunity to send our Firefighters to the Canadian Forces Fire and CBRN Academy (CFFCA) at CFB Borden in Ontario Canada. CFFCA has a first class training facility that trains both Canadian Forces Firefighters (Military) and Civilian Firefighters that provide support to the Canadian Armed Forces (CAF). Training is conducted in accordance with NFPA standards for a wide variety of fire service disciplines. We often send personnel to the CFFCA for training, and the academy has the ability to recertify our members for ARFF. This option has both pros and cons. Although would be getting great training with exceptional training props, it is very costly to send all of our personnel

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**Introduction**

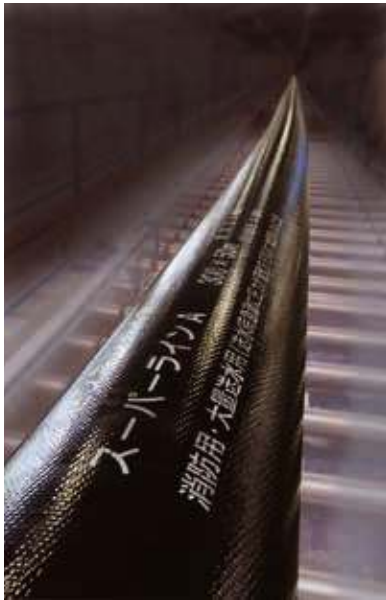
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Weight	kg/m	1.1	1.6	2.8	4.0	4.8
Burst pressure	MPa	4.2	4.4	3.6	3.0	2.8
Maximum working pressure	MPa	1.6	1.6	1.4	1.4	1.4
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# The Institution of Occupational Safety and Health (IOSH)

Ensuring the right culture is in place is crucial for fire safety within a workplace.  
 Dr David Gold, chair of the Institution of Occupational Safety and Health's (IOSH) Fire Risk Management Group, examines who is responsible for instilling this culture among workers.



**David Gold**

**T**here are many safety and health risks faced by businesses in the modern world.

One of these is the risk posed by fire. Every business, no matter where in the world they are, needs to ensure that their employees and members of the public are not put at risk from fire.

To do so, they need to have a fire prevention strategy in place. However even with a strong fire prevention strategy they should also have incident management plans to ensure people do not come to harm should a fire happen.

Key to all of this is having the right culture throughout the workplace; a culture where everyone looks out for each other and one where everyone recognises their responsibility to act upon or report any hazards they come across immediately.

The vital link in instilling such a culture within a business is the occupational safety and health (OSH) professional. Fire safety – both fire prevention and fire protection – is part of what they do, albeit a very important part.

That was the basis of a discussion at a Parliamentary reception in London on fire safety held by the IOSH Fire Risk Management Group recently.

Delegates at the event, who included MPs and Peers, heard that we must ensure that fire safety is very much on the map when it comes to OSH, whether it is in the UK or any other part of the world.

**Building a culture**

There is of course a fire services adage that there are three main causes of fire: men, women and children. IOSH focuses on developing safety cultures in organisations where everyone works together and looks after each other to avoid workplace injuries or work-related ill health, with leadership and management

playing a key role. Building such cultures of prevention needs to include a process of life-long learning, which is where OSH professionals come in.

In workplaces, employees will often come across a situation they are uncomfortable with, which pose danger to either themselves or their colleagues.

A number of these situations could be fire-related. It could be a source of fuel, such as waste, cardboard boxes, or flammable liquids which have not been properly stored. It could also be a source of heat, such as hot surfaces or open flames. Frequently, fire protection may be compromised, such as obstructed passageways and emergency exits.

We want to build a culture where workers do not accept such situations and take action for either correcting it or reporting it. If they don't then it may lead to others being harmed.

We don't want them to ignore it, thinking either it isn't worth reporting because the likelihood of any harm being caused is low, their concern won't be taken seriously or the next person who recognises the risk will act on it.

So, how do OSH professionals build this culture? And what challenges must they overcome in doing so, including from those at the highest level?

If you take the example of the government in the UK, there is a separation of the responsibility for fire safety, which falls under the Home Office, and the regulation of occupational safety and health, which falls under the Health and Safety Executive. In the workplace, however, the overall responsibility for both rests with top management, with the technical support of the individual or unit responsible for health, safety and environment.

This separation sometimes means that fire safety can fall through the cracks,

**Dr David Gold became Chair of IOSH's Fire Risk Management Group in September 2016. He is a Chartered Member of IOSH and is the founder, managing director and international consultant at Gold-Knecht Associates.**





◀ Gary Laird addressing delegates.

something we are pleased to see.

But that does not mean that we can be complacent about fire safety. Fires do still happen, including in business as well as domestic premises, and people are killed or injured by them.

Fire safety cultures should be central to a building from the beginning. It should be considered right from the design stage.

So, in essence, OSH professionals have a role to play in fire safety from the design stage of a building right the way through to it being in use and beyond. They must ensure that there is no complacency about fire, both among senior leaders and the rest of the workforce.

Just because a business premises hasn't had a fire does not mean you can sit back and relax. It is vital that all organisations effectively plan for, train and review incident resilience and business continuity plans.

We all need to take responsibility.

### IOSH Fire Risk Management Group

The event in the Houses of Parliament was the latest to be held by IOSH's Fire Risk Management Group.

We currently have over 3,000 members, who we support through providing networking opportunities and helping with their career development. We also work with the Fire Sector Federation and industry committees to ensure our members' opinions are heard.

Fire Risk Management is one of 16 IOSH groups. These represent a variety of different industries, from construction and offshore to railways and education.

The institution itself has over 46,000 members in 120 countries and is the world's biggest professional health and safety organisation.

It sets standards, and supports, develops and connects members with resources, guidance, events and training. It is the voice of the profession, and campaigns on issues that affect millions of working people.

IOSH was founded in 1945 and is a registered charity with international NGO status.

➔ For more information, go to  
[www.iosh.co.uk](http://www.iosh.co.uk)

but it doesn't have to be the case, nor should it be.

To overcome this, the OSH professional needs to maintain the knowledge and skills to continually assess risks, including fire-related risks. They also need to be continually engaged in assisting top management in building and maintaining organisational policy, enabling measures to ensure fire prevention and fire protection, fire safety planning, and training and drills. In addition, should an incident occur, they need to ensure emergency management, crisis management and business continuity. The OSH professional is frequently an integral part of the on-site incident management team.

This is not to say that OSH professionals have sole responsibility for fire safety, far from it. All workers have a responsibility. But what OSH professionals do have is a key role to play in the overall effort to ensure workers are not harmed by fire, starting from building the right culture.

This can be done in many ways, including training and educating employees in fire safety and getting messages across about whose responsibility it is.

OSH professionals must be fire safety competent

I recently became chair of the IOSH Fire Risk Management Group. The group is one of many which represents IOSH members across various industries. Our group has 3,000 members. But it is not just these members who have fire safety as part of their remit – it is all OSH professionals.

This is a message we are keen to get out there as a committee and was one we focused on during the IOSH event, which was held in early September 2016 and was arranged to mark the 350th anniversary of the Great Fire of London.

I was delighted to be able to give a presentation on behalf of the International Labour Organization. We also heard from Brian Robinson, from the Fire Sector Federation, IOSH Vice-President Andrew Sharman and Gary Laird, former Chair of our Fire Risk Management Group.

The causes of that huge fire in 1666 and the reasons behind its rapid spread from the bakery in Pudding Lane right across the UK capital city are of course well known, and many lessons were learned as a result of it.

London today is a vastly-different city and across the world the number of deaths from fires continues to fall, which is

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# HCN and CO in firefighting and emergency medical services

Smoke and gases generated in today's fires are more dangerous than they've ever been. Thankfully more knowledge and better equipment can help us deal with that increased danger.



**Griff Mason**

**H**ave you or members of your team experienced a headache, sore throat or nausea after a fire? The answer is likely yes, and if so, you have been warned, there's more you need to know. Today's fires involve burning plastics and polymers that can quickly cause permanent injury. The reality is in, near and after today's fires even minor symptoms can be an indication that harm has been done. Those small symptoms can even lead to significant long term damage. We must be proactive. We can no longer afford to assume that minor symptoms are not important or that EMS teams,

Command teams, Pump operators, firefighters near an active fire, those cleaning up after the fire or even those investigating later are safe.

The intention of this is to share with you some of what we've learned from our customers and multiple other sources as our company has investigated and developed HCN monitoring equipment. It's obviously a complex topic so we'll attempt to address the more important things we all need to understand about HCN (hydrogen cyanide) and it's "evil twin" CO (carbon monoxide). We'll also be sharing sources for more information, training, sample HCN SOG's, etc.



► Monitoring by sampling the air whenever you are out of SCBA in, near and after a fire is really the only way to know you're OK.

Griff Mason is President of Airspace Monitoring Systems, Inc. Airspace specializes in monitors using solid state technology that is longer lasting and does not require calibration.

Image courtesy of Airspace Monitoring Systems



Why is HCN so dangerous? The answer begins with the fact it is very likely to be in and around every fire today. It's readily assimilated by Inhalation, ingestion and absorption through the skin, eyes, etc. Small amounts do create harm and it's even more harmful when combined with Carbon Monoxide. Damage has been shown to be cumulative so every exposure matters. Actionable levels for CO are 30ppm – its 4.7ppm for HCN. HCN causes harm by killing organs either immediately or over time. Factor in that CO deprives those same organs of oxygen, often at the same time and you can see how the overall impact becomes even more sinister.

"Exposure to smaller concentrations can initially cause respiratory activation (manifested by rapid breathing and tachycardia) in an attempt to compensate for lack of oxygen. Early manifestations include headache, anxiety, blurry vision and loss of judgment. As cyanide accumulates further, signs and symptoms of poisoning reflect the effects of oxygen deprivation on the heart and brain. These include cardiac dysrhythmias, seizure, coma and death. The time between exposure and incapacitation or death is typically minutes,

but varies depending on the concentration of cyanide and other toxicants. Obrien, DJ, Walsh, DW, Cyanide and Smoke inhalation, 2010

"Not all HCN and CO related fatalities are caused by asphyxiation. Many cardiac related fatalities that we're experiencing may very well be related to CO and HCN exposures over time. Todd Shoebridge, Carbon Monoxide and Hydrogen Cyanide Make Today's Fires More Dangerous, Firefighter Nation, Feb 14, 2012.

"Another underappreciated effect of exposure is the death of individual cells. Even if the entire organism is not killed by a given exposure, such exposures can kill individual cells in an organism. The cells most susceptible to this effect are those in the heart and brain. As time goes on, the cumulative effects of such cell death at repeated exposures can result in chronic heart and nervous system disease." Jean Marie McMahon, MD in Smoke Cyanide and Carbon Monoxide: The Toxic Twins of Smoke Inhalation, Cyanide Poisoning Treatment Coalition, 2009.

Is HCN really that prevalent? Natural sources of hydrogen cyanide are burning grass clippings, green wood, green

▲ This stage of a fire has our full attention – but the danger doesn't end when the smoke is gone!

weeds, tobacco, cotton, paper, wool, silk, even animal carcasses. Significantly higher levels come from combustion of manmade plastics and resins. Nylon, polyurethane, melamine and acrylonitrile are present everywhere in our world today, especially in buildings and vehicles. Foam insulation, furniture, carpet, drapes, appliances, most plastics and that includes most clothing today – all produce HCN when burning.

A burn study sponsored by the Fire Smoke Coalition and Tarrant County College, Fort Worth Texas in March of 2011 found significant levels of HCN were evident in open air sampling of an outdoor burn. The highest levels were recorded at incipient start of fire and smoke production and during the smoldering period as the fire wound down but were evident in harmful amounts throughout the burn and after. HCN was also found present in areas there was not smoke.

An eight month study in which monitoring for CO and HCN at fire calls





Image courtesy of Airspace Monitoring Systems

▲ **Passive screening by a monitor attached to equipment that always goes along is the best way to be safe in emergency response.**

responded to by the Columbia, SC Fire department was conducted in 2008. It resulted in air monitoring measurement results from approximately 40 structure fires. It found “staggeringly high HCN levels at almost every scene”. Worst offenders for HCN production in that study were; “Pot on a stove/cooking fires (average small kitchen fire produced 75 ppm of HCN), car Fires, dumpster fires and in overhaul operations. That study resulted in writing an SOG to address the problem which details the use of PPE, SCBA and metering in every fire response. That SOG is being shared and is available by on line search.

There's more than HCN in Fire Smoke and proper SOGs can protect you from those other dangerous gases as well. Modern fire smoke contains things like Vinyl chlorides, formaldehyde, oxides of nitrogen, phosgene (sometimes used as a chemical warfare agent), hydrogen sulphide, chlorine and ammonia as well as carbon monoxide and Hydrogen Cyanide (HCN). Our understanding of HCN is maturing and as it does the danger from that gas stands out. We've known CO was responsible for many fire deaths and early retirements and now we're discovering when combined with HCN they become “Toxic Twins” – together even more dangerous than either of them alone. The

good news is protecting ourselves from those other dangerous gases is a side benefit of using PPE (personal protection equipment), SCBA (self contained breathing apparatus) and monitors that can tell you it's safe to remove that equipment for CO and HCN.

We can't afford to relax when the smoke is gone. The same dangerous gases can still be a factor – and now we can't see them so here's where knowledge and training really count. Both gases are long lived and not easy to break up so they tend to be present in dangerous amounts for some time after the active fire has been eliminated and the smoke is gone. That creates the need to keep PPE and SCBA equipment intact until metering can show neither HCN nor CO are present – even after the smoke is gone! It's important to note studies have shown that while frequently found in the same places the presence of CO or HCN doesn't necessarily predict the presence of the other.

The soot and particulate matter we get covered with also present a danger. Lightly hosing off your outer gear should be a standard practice – especially before going into a rehab or other “clean” environment. Be aware that a person being rescued from a fire or to whom you are providing medical services may be off-gassing an unacceptable amount of HCN that has been absorbed into the soot and particulate matter covering them – or even from their clothing and skin. Use a monitor to be

safe – or don PPE and SCBA proactively. A spray of water will help to remove contaminants. Wash face, hands and any other area that might have been exposed in the fire as soon as you are out and shower as soon as practical. Thorough washing of PPE should also be done as soon as practical and never allow PPE to remain in living or sleeping areas.

How long after a fire do we need to be concerned? Only monitoring can tell you. A firefighter recently shared they found only CO in an apartment building after the fire was out but found HCN in the next four adjacent apartments. HCN is very stable. While its evil twin CO breaks down eventually to become CO<sub>2</sub>, HCN needs to be washed or blown away – it doesn't break down. It's also readily absorbed by many materials – including our skin, from which it continues to gas off for some time after the fire and smoke are gone.

How much is too much? The numbers for acceptable exposure keep coming down as scientists gain more knowledge about HCN. We also have to consider that when combined with CO both gases are more dangerous. The current Short Term Exposure limit (STEL) recommended by NIOSH is 4.7ppm. This is also the ceiling limit of exposure recommended by the American Conference of Industrial Hygienists. OSHA still uses 10ppm as their short term exposure limit but EPA lists 10ppm as creating possible adverse medical impacts in as little as 30 minutes. HCN is estimated to be 26 to 35 times more toxic than CO.

There is a significant perimeter around an active fire that is not safe. We have many crews that carry our portable carbon monoxide monitors as passive screening and personal protection devices so they are with them all the time. Those users have reported sensing CO in command and rehab centers that were set up near active fires but were not being continually monitored. CO and HCN are often in the same locations. The only way to know you are outside the perimeter of danger from those gases is to use a monitor that can tell you the air is clear. Live air sampling is the only safe way to pick a spot to set up Command, EMS, Rehab, etc. Continuous monitoring is the only way to know it continues to be safe. Note the CO monitor that is wall mounted in many EMS and rehab trailers is going to report a time weighted average – they won't alarm in

smaller (20 to 60 ppm) amounts of CO until the alarm has been exposed for several hours. One of our customers reported his CO monitor reporting 40ppm in a trailer being used for rehab several hours after set up while the wall mounted device had not responded.

We need to address this increased risk! Metering and using SCBA and PPE that limits the exposure of eyes and skin should be considered a minimum while working in and around any active fire, see Air Management (NFPA 1404). Atmospheric monitoring to determine when the air is safe for all-clear to doff SCBA should include HCN. Air monitoring should be used to be sure areas set up for rehab, command and other operations are outside – and stay outside – of the perimeter of danger for those gases at any active fire. Only metering can confirm pump operators and others near an active fire are safe. We need to be aware that off-gassing from gear worn into a fire or victims rescued from an active fire may put you in danger. The bottom line is your crews safety, as well as your own requires

that constant air monitoring be conducted any time you are out of SCBA and PPE at any active fire scene and on into overhaul, clean up and investigation.

Promote standard operating guidelines (SOGs or SOPs) for your department if yours doesn't already address these two very dangerous “toxic twins” (CO and HCN). One resource is an organization called the Fire Smoke Coalition. They offer web based education, training programs – even an “ask the expert” service. This is what they have to say about the management of dangerous gases including HCN; “In the end, implementation is up to department leaders. Many leaders have attended Know Your Smoke, became believers and ultimately made wide-sweeping departmental changes in standard operating procedures for the sole purpose of saving firefighter lives. If your department is struggling through the process of implementing new SOG's to prevent firefighter exposure to fire smoke, and, just as important, changes in treatment for exposure, the Coalition maintains a database of departments

and contacts who have gone through the process who are willing to share information.” They are available at [www.FireSmoke.org](http://www.FireSmoke.org).

There are some new technologies available in monitors. Our company has developed an HCN monitor that does not need to be calibrated and offers several years of warranted service. There are also several brands of HCN detectors as standalone devices or in combination with other gases that can be considered.

Knowledge regarding HCN is relatively new but it is compelling and ignoring the inherent danger it presents has the potential to shorten our lives. Knowledge is your basic defense. Learn more at the conferences, through the Fire Smoke Coalition, NFPA and others. Make sure your SCBA and PPE equipment is intact and up to date. Check into monitoring devices to protect yourself and your team. Your successful and long life may depend on it!

➔ **For more information, go to**  
[www.airspaceinc.com](http://www.airspaceinc.com)

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**REQUIRES NO CALIBRATION.**

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**NO MORE WORKING IN FEAR OF THE EVIL TWINS**, CO and Hydrogen Cyanide are being recognized as the evil twin gasses that are present in, around and after almost every fire. Finally, we are offering an affordable and effective way for you to monitor HCN;

**During overhaul and mop up operations**; you can know you're not in cyanide.

**Fire Investigation can be less dangerous.** No longer risk being exposed to HCN.

**Know your rehab and command operations are clear.** Yes, it happens. If you're on scene anywhere near an active fire, so are the evil twins. We have reports of CO found by our detectors in those areas. Now you can be sure there's no HCN as well.



Find out more 1 888 654-5126 [www.airspaceinc.com](http://www.airspaceinc.com)



# New aerial sensors offer firefighters and rescue crews improved capabilities

They were first deployed to Iraq and Afghanistan back in 2006 and 2009. The objective was to help the U.S. military beat back the threat of improvised explosive devices, or IEDs, which have been responsible for at least half of all Coalition casualties in those two countries.



**Doug Rombough**

Doug Rombough is VP for Business Development at Logos Technologies.

**S**ince then, wide-area motion imagery (WAMI) systems have gotten smaller, lighter and more power-efficient thanks to advances in commercial off-the-shelf technology. This trend has also expedited WAMI's availability to international customers – and not just for defense and homeland security missions.

WAMI sensors can also serve as powerful tools for firefighters and rescue crews. These systems house multiple video cameras that image in near-real time and record vast stretches of territory – kilometers in diameter – simultaneously detecting and keeping track of hundreds of people, vehicles, features, and phenomena.

In the field, WAMI sensors mounted on aircraft (manned and unmanned) or tethered blimps could help in the managing of complex disaster response operations, guide search parties to boats lost at sea or hitchhikers in open terrain, and aid in fighting wildfires.

## Disaster Response

In late August 2005, what began as a tropical storm around the Bahamas rapidly swelled into Hurricane Katrina, which slammed into the Gulf Coast of the United States. The hurricane – the deadliest the country had seen in 77 years – killed an estimated 1833 people and left more than a million homeless across the states of Louisiana, Mississippi, and Alabama.

Bridges were damaged, roads were flooded, houses collapsed, and phone service was severely disrupted. People were trapped all over the region. In New Orleans, where Katrina claimed more than half its victims, the levees and flood wall failed, leaving 80 percent of the city under water. In some areas, people had to climb to their roofs to keep safe.

To survey the devastation and direct rescue teams in the field, federal and state authorities relied on imagery

▼ Redkite WAMI sensor pod in flight.



pulled from satellites and snapped from airplanes. Even a U-2 spy plane was enlisted for a flyover. But that was it. There was no real-time wide-area solution deployed for Katrina (the technology was still experimental at the time) – nor for Hurricane Sandy, which hit the northeast seven years later.

But WAMI systems, matured and now available to both civilian U.S. and international agencies, are ready to fill the surveillance gap. Indeed, mounted on a plane, helicopter, drone, or – if weather permitting – a large tethered balloon, a single WAMI sensor can image an entire city-sized area in near-real time. With such a system, operators can detect, track, and record for later analysis the movement of people and vehicles over a span of hours, days, and even weeks.

In Iraq and Afghanistan, WAMI sensors have been deployed to roll up networks of insurgents. The system allows operators to focus on certain key zones within its vast field of view by either opening video windows on them or drawing a “watchbox” around them. These watchboxes then serve as a digital tripwire, sending an automated alert to the operator if movement is detected.

This same technology, in civilian hands, could be brought to bear before a hurricane, tornado, or other extreme event strikes. A WAMI system could, for example, be used by municipal governments to modernize evacuation plans by flying over roadways and bridges, recording traffic patterns, and identifying potential bottlenecks.

Likewise, WAMI sensors would be useful following a natural or manmade disaster. The system could track the advance of flood waters, monitor large surface cracks in case of an earthquake, and survey in near-real time the condition of roads and bridges leading in and out of affected areas to coordinate rescue efforts, aid delivery, and the establishment of temporary shelter.

Is there a family on their roof and surrounded by flood waters? Is there a car that's run off the highway? A WAMI system could help direct rescue crews to these people. It could also work in tandem with high-definition, narrow-field cameras, cueing them to look for other potential survivors. Doing so allows authorities to cut down on sorties and time above any given area.



▲ Kestrel KS-200 WAMI sensor for aerostats.

Finally, since a WAMI sensor can simultaneously look at multiple, large areas within its even more expansive field of view, the system enables operators to prioritize those that are hit the worst – something a standard camera looking at a single, circumscribed area could not do.

## Fighting Wildfires

Besides disaster response, another mission area where WAMI sensors would be of value is combating wildfires, which have been growing increasingly dangerous with time. Indeed, last year was a scorcher for the United States, with 68,000 wildfires raging across 10.1 million acres. But more significant than the scope of the destruction was that it was accomplished with comparatively few fires. For example, in 2006, it took 96,000 fires to burn 9.8 million acres.

The National Interagency Fire Center attributes the rise of these newer, faster conflagrations to – among other factors – a warming global climate, and the U.S. Forestry Service estimates that the fires will get even stronger in the coming

decades due to more frequent and longer lasting heat waves. Firefighters, therefore, will need a way to identify and stop fires more quickly.

In California, which is suffering from a six-year drought and is second only to Texas in number of fires in the United States, the local fire protection agency has stationed spotter aircraft – repurposed AH-1 helicopters and OV-10A planes – on 22 bases across the state, allowing for a response time of under 20 minutes to most emergency calls.

The U.S. Forestry Service, meanwhile, has been exploring the use of drones, to fly at night when manned firefighting aircraft are grounded. The hope is that the drones will provide an additional means to detect, assess, and prioritize fires; monitor fire behavior, rate, and direction of spread; and conduct post-fire assessments.

But that still leaves the issue of sensors. Satellites cannot provide real-time monitoring, while the infrared, low-light, and hyperspectral sensors (to detect trace



gases from burning biomass) employed on spotter aircraft have a narrow field of view, requiring multiple sorties, which can be expensive and time-consuming. That's why people are starting to look at WAMI.

WAMI supplements existing fire detection capabilities in numerous ways. For example, its ability to image an entire city-sized area and keep a watch over multiple areas at the same time provides a comprehensive monitoring solution for even the most remote wilderness. Should a fire break out, WAMI can also follow the effectiveness of retardant efforts. And by recording everything it images, it enables park rangers, environmental technicians, and other end users to document the origin and evolution of a fire, providing crucial insights for the future.



Images courtesy of Logos Technologies



▲ Simera WAMI sensor dangling from large aerostat.

◀ Simera WAMI sensor on aerostat (tethered balloon/blimp).

While many of the currently exportable WAMI systems only employ electro-optical cameras, others also have infrared cameras or are in the process of having them incorporated. These latter WAMI systems can detect – in addition to smoke and open fires – hotspots before they burst into flame, tracking potential threats, and keeping firefighters on the ground safe.

### Search & Rescue

Finally, there is search and rescue. For most cameras, it is a challenge to penetrate foliage to, say, find hitchhikers lost in the woods. Likewise, the effectiveness of infrared is limited when trying to locate someone floating in the water because most of the body temperature would be beneath the surface. Nevertheless, WAMI systems can find boats at sea or people out in open terrain – covering vast areas in a short period of time, where time can mean the difference between life and death.

Since first being fielded in 2006, WAMI sensors have proven themselves in Iraq and Afghanistan, where they have saved the lives of U.S. troops by detecting enemy ambushes in real time and rolling up IED networks by tracking movements through recorded imagery. This same technology in the hands of firefighters and disaster response teams could likewise save lives around the world. It's just a matter of incorporating them into civilian toolkits.

➔ For more information, go to [www.logotech.net](http://www.logotech.net)



▼ Redkite WAMI sensor pod on a Cessna.



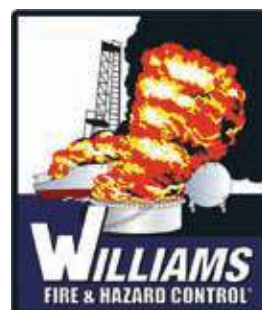
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# Xtreme fire training with the best in the business

Williams Fire & Hazard Control hosted its world renowned XTREME Industrial Fire & Hazard Training School on 25th – 29th September 2016, at the Gesip Fire Training Facility near Vernon, Northern France.



**A**ttendees of the five-day course benefited from the combined experience of Williams' renowned rapid response team, who have successfully fought over 200 of the industry's most threatening flammable liquid fires during the last 34 years.

The course was designed to offer a comprehensive hands-on learning experience for those involved in operational industrial fire response at on-shore petroleum, oil and gas facilities and to benefit emergency

response specialists and HSE managers. The participants were taught the latest methodology and fire behaviours using real life case studies and had the opportunity to tackle real pressure fed, hydrocarbon fuel, combined elevated tank and bund fires.

The Hot Course, which incorporated live fire exercises, was designed for those directly involved in operational roles, such as fire officers and municipal fire departments. The Cold Course was attended by specifying engineers, safety consultants, corporate safety specialists, Chief Fire Officers and CEOs.

In addition to learning fire behaviour and tactics from experienced industry

specialists, participants also had access to hands-on training with the latest product innovations from Williams, including the impressive Ambassador 2X6 Gun Trailer, capable of discharge flow rates between 2000-6000 USGPM (7571-22700 LPM).

Williams is the only global company that responds to emergencies with its own hardware and specially formulated foam concentrate that are designed to exceed industry performance standards, know to Williams as compliance plus. As a result, the participants experienced the results of the learnt foam chemistry first hand.

Chauncey Naylor, Director for Training & Emergency Response Operations at Williams, commented:

► The Ambassador 2X6 Gun Trailer in action.

"When faced with fires at petroleum, oil or gas facilities we have learnt that it is experience that makes the difference and this course can be the perfect opportunity to gain that experience in a safe environment. Everything that we do is governed by in-depth knowhow whether it be designing new products, writing methodology or formulating new foam and we want to impart this knowledge on to as many people in the industry as we possibly can."

In addition to learning from industry leading professionals at Williams, participants also benefitted from being able to discuss best practice and scenarios with their peers from across the sector. A participant on the course commented: "This course provided me with invaluable opportunities to ask all the questions I had ever had in relation to foam and the way it reacts with oil fires. If I had received input from Williams at the beginning of my career I would have done things a whole lot differently. It was great to be taught by the industry's best."

The Xtreme foam workshop was based at a foundation level with understandings of the methodologies, tactics and technology used to protect major petrochemical, tank storage Oil and gas industries globally. Classroom study and practical exercises covered various incident profiles and fire dynamics, including foam and dry chemical applications, response logistics, fire ground operations and large-volume equipment applications.

The classroom and laboratory presentations introduced participants to the fundamentals that make AR-AFFF foams so special, and why Williams insists on the very best performance in their foam of choice.

The 'Live Fire' training skill sessions / exercises involved pressure fed fires, combined elevated tank and bund fires with a 200m<sup>2</sup> fire area, hydrocarbon pressure fuel fires, all scenarios had been designed to typically replicate real fire ground conditions, use of coordinated foam applications and hydrochem applications, ground-monitor deployment and large volume Big Gun logistics.



Drawing from Williams' recent response activity and the experience of leading fire professionals throughout industry, students were able to get a closer look at response events that have occurred around the world – assessing

event characteristics, response methodology, and event impact.

An added bonus of the course was that students who successfully achieved the competency required have been issued with a certificate of competency from Texas A&M University.

▼ Participants tackling the elevated tank and bund fire.

► For more information, go to [www.williamsfire.com](http://www.williamsfire.com)



Images courtesy of Duncan J. White



Images courtesy of Duncan J. White



# Drones are changing fire fighting operations worldwide

Unmanned aerial vehicles (UAVs) used to be the remit of the military and sci-fi films. Recent advances in technology – and changes to aviation laws worldwide – mean they're now available as tools for all types of business, including emergency services and fire fighting operations.



**Steve Coulson**

Steve Coulson created Coptrz after fifteen successful years innovating technology to improve performance and safety in the shipping industry. He discovered the wide possibilities of UAVs and that was it! A drone enthusiast (and Coptrz) was born.

**W**hen you hear the word 'drone' you probably imagine one of two things: huge oversized gliders used by armies for reconnaissance, or tiny hobby drones a five year old could fly. Fire fighters wouldn't use either of these! There are many, many types of UAV available these days – but fire services need to be very picky about the platform they choose. The right drone platform will fly in harsh conditions without difficulty, have greater reliability, carry high quality imaging equipment, have a thermal camera as standard, and perhaps most importantly will have a solid integration with other communication systems in the force.

▼ The Zenith drone platform is a popular choice for emergency services teams due to its versatility and ability to operate in harsh environments.



## Increased safety for fire fighters

One of the key benefits of using a drone during fire fighting operations is increased safety for both fire crew and civilians. A drone can be sent to monitor an existing blaze at very close range to identify hotspots, potential explosion points, and possible rescue pathways.

With real-time images fed back to a ground team, immediate decisions can be made with confidence. This in turn increases the speed with which fire crews can approach a blaze and rescue any person still in the vicinity.

## Thermal imaging versus RGB cameras

Most drones will carry at least one camera as part of the standard payload: however one for a fire service should have both thermal and visual spectrum (RGB) imaging. Fire crews are required to perform many services, with tackling fires just one of them: having a drone only equipped with a thermal camera restricts the tasks for which it can be used.

When equipped with a thermal camera such as the DJI Zenmuse XT Thermal, high resolution images are fed back straight away to a ground team. The high sensitivity on the camera means temperature can be measured by every single pixel – and alarms even set for temperatures which are too high or below a certain temperature.

A thermal camera can also be used after a fire has been put out to assess the safety of a structure post-incident. Areas which are still particularly hot (or even particularly cold) highlighted on the thermal camera also provide vital clues to investigators on the cause of the fire.

On the other hand, a visual spectrum camera is ideal for assisting other emergency services as well as the fire crew on the scene. A drone with an RGB camera can provide real-time monitoring for crowd control, and also highlight potential additional hazardous structures nearby (such as gas tanks on a rooftop) which may otherwise be missed by usual assessment tactics.

Getting to, and coordinating, a large incident is made all the more helpful with a flexible eye-in-the-sky. Vehicle routes become more obvious and easier to direct, while immediate damage assessment can be made from the air to identify possible hazards such as buildings which may collapse. A drone fitted with a high quality RGB camera can get as close to these possible hazards as physically possible (within a few feet!) to assess even tiny structural problems and help ground teams create hazard-free clear zones to operate in.

## It's not just about fires

Fire crews don't just attend fires, so the drone in their arsenal must be suited to multiple tasks.

Search and rescue operations become instantly easier and more successful with a drone to hand. Thermal imaging cameras can pick out body heat: currently, imaging is either by hand (slow) or helicopter (canopies and indoor structures are impossible). A drone is flexible, fast, and can identify minute thermal fluctuations with ease.

Whether seeking a single person or finding hundreds in the rubble after an earthquake, drones are an essential tool for speeding up search operations without increasing harm to fire crews. The UAV



Images courtesy of www.droneflight.co.uk

▲ Drones can be used to inspect hazardous areas such as high voltage power lines and potentially dangerous structures, while fire and engineering crew remain in a safe zone.

► Thermal imaging cameras on a drone enable fire crews to identify hazards, hotspots, and even find missing people under rubble on a search and rescue mission.



can access areas not easily available to people on foot, and stops them from having to go into dangerous buildings or areas which may be structurally unsound.

Finally, we can't forget the other form of payload carried by UAVs: sensors. When attending a possible gas explosion, for example, a fire crew can send in a drone fitted with an air analysis sensor. Data is captured and relayed immediately: if gas is present, the relevant precautions can be taken. If not, crews can act accordingly and make the incident site safe again as quickly as possible. Sensors can be fitted for all sorts, even radiation.

## Accident investigation with UAVs

A post-incident report is much, much easier to create with drone footage recorded in real-time during the event. It also enables accident investigators to analyse the blaze in detail to aid the formation of a cause theory, and the surveillance aspect of drones above an

incident could also assist police forces with footage at a later date.

## What's next for drones in firefighting?

With increased payloads, exponentially fast technological developments, and more trained drone pilots available than ever, drones are set to become an essential tool in every fire crew's kit. While the type of commercial drone required is budget-busting compared to the hobbyist's Phantom 4 or BeBop, the sheer amount of time saved – and increased safety – seriously outweighs cost implications.

Drones provide an extra safety net to fire crews – and may even one day assist in dousing hard-to-reach fires too! Sounds like science fiction – but so did mobile phones only a few decades ago...

➡ For more information, go to [www.droneflight.co.uk](http://www.droneflight.co.uk)



# Fast and accurate environmental information is critical to firefighters

When fighting wildland fires, information is power. Fire behavior is driven by topography, fuels and weather. Accurate readings of temperature, humidity, wind speed and wind direction are critical to predicting future fire behavior and building a plan of attack. Firefighters need the most accurate information available to choose the right tactics and equipment to battle an ongoing burn. This data is just as important when planning a prescribed burn to ensure it does not spread out of control. Kestrel Weather Meters provide fast and accurate measurement of the critical weather conditions impacting the behavior of wildland fires and prescribed burns.



**Austin Wilcox**

## Why weather observations matter

Firefighters take weather observations during a wildfire or prescribed burn in order to track conditions and share information with other members of their team. Understanding how conditions are changing and when to adjust tactics is key to managing a fire and keeping firefighters safe. These weather observations help fire meteorologists build their forecasts and weather pattern models, which then drive fire behavior forecasts. At the end of the day, meteorologists analyze the earlier weather observations and fire behavior and compare those against their forecasts, helping them to improve their predictions and awareness going forward.

## Speed is of the essence

The firefighting environment is fast-moving, dangerous and high stress. The tools a firefighter uses must feel like second nature and work quickly and accurately. Finding wet bulb temperature using a traditional sling psychrometer can take several minutes. In real world field conditions, wicks get dirty and must be replaced, distilled water isn't always available, searching for and reading old paper charts causes delays, and

▼ Fire authority (below) employs a Kestrel Weather Meter to accurately gauge fire behavior and adjust tactics.



Austin Wilcox is a senior product manager at Nielsen-Kellerman. He works on product launches, market exploration and expansion strategies for the company's ballistics and Kestrel lines.



Image courtesy of Nielsen-Kellerman

hand written weather observations can be difficult to read. In contrast, a Kestrel Fire Weather Meter can provide wind speed, relative humidity, temperature, probability of ignition (PIG), psychrometric wet bulb temperature, altitude, pressure trends, barometric pressure, dew point temperatures, heat stress index and wind chill environmental measurements in seconds in any conditions and then transmit those measurements where they need to go using iOS or Android devices.

## Inaccurate readings are harmful

It doesn't matter how quickly weather readings are available if they aren't accurate. Not only is the standard belt weather kit more laborious to use than a Kestrel Fire Weather Meter, a Kestrel is also more likely to give consistent, accurate readings. Sling psychrometer relative humidity readings have been shown through government research, on average, to read high by 9.4% or more\* due to any of the following common mistakes: not swinging the psychrometer long enough, not saturating the wick, taking too long to read the thermometers, touching the bulb ends while reading, and not facing into the breeze, meaning the wet-bulb temperature reading will be too warm and the relative humidity will read too high.

In addition to being properly operated, belt weather kits must be properly

maintained. Each fire can cause defects, old parts can break from overuse and in the case of electronic sensors, they must be routinely calibrated to ensure accuracy. Body heat, sweat, dirt, ash and direct sunlight can all negatively affect the accuracy of sensors and their storage is crucial to their effectiveness.

One of the most frequent sources of error in fire behavior forecasting is difficult to read weather observations or insufficient data and trends. Using a Kestrel meter to take measurements means the data is automatically and continuously logged on the device, and several models offer wireless connectivity to send weather data to mobile devices among a crew's key team members. Being able to send easily readable weather observations and historical data trends eliminates yet another opportunity for user error and provides a complete picture of conditions on the fire.

"As a United States Aerial Delivered Firefighter, I require the best gear available to accomplish our missions. The Kestrel Fire Weather Pro weather meter provides me with the highest technology made to date. I count on precise measurements on a fire or any other emergency incident. Kestrel is my choice for professionals," explains Jason A. Ramos, a veteran firefighter and author of the memoir, Smokejumper.

▲ Fire authorities (above) improve conditional safety and gather accurate, timely readings with the help of Kestrel Weather Meters.

## Preventing heat stress related injuries

Measuring Wet Bulb Globe Temperature (WBGT) and applying ACSM and ACGIH guidelines during firefighting operations and during training is recommended by the National Institute for Occupational Safety and Health to keep firefighters safe and prevent heat stroke related injury and death.\*\* WBGT is the most accurate model for predicting human heat stress. WBGT is based on an equation that uses a combination of environmental factors (temperature, humidity, wind speed and solar radiation) to calculate a reading that estimates human heat stress. Not to be confused with "heat index", which measures only temperature and humidity, WBGT is used by the military and Occupational Safety and Health Administrations (OSHA) to protect and prevent heat related injuries. The Kestrel 5400 measures WBGT and with preprogrammed safety zones and an alert light and buzzer is an ideal tool for field and training simulations.





Image courtesy of Nelson-Kellerman

◀ The Kestrel DROP 3500FW provides fire authorities like this one with wireless, accurate readings.

▲ Kestrel Weather Meters are a favored tool among professionals for prevention and preservation.

### Features and capabilities at a glance

- The Kestrel DROP D3FW Fire Weather Monitor with LiNK™ wireless data connectivity is ideal for data logging temperature and humidity on a prescribed burn site to view trends and plan the safest burn times. DROP measurements can be viewed real-time and data logs can be retrieved from 100' away and then exported via email with an iOS or Android device and the free Kestrel LiNK app. The DROP D3FW is available for \$129.
- The Kestrel 3500FW Fire Weather Meter offers fast, accurate on-the-spot measurement of weather conditions including wind speed, temperature, humidity, pressure and altitude, and includes a waterproof Probability of Ignition ("PIG") reference card. The Kestrel 3500FW Fire Weather Meter sells for \$199.
- The Kestrel 5500FW Fire Weather Meter Pro provides all necessary measurements for fire weather observation including wind direction and pre-programmed PIG and Fine Dead Fuel Moisture ("FDFM") measurements. It may be used as a handheld unit or mounted to a tripod with the secure vane mount, creating a fully capable compact

weather station. The 5500FW logs key measurements even when off, providing in-depth insight into trends. With optional LiNK wireless connectivity, measurements can be viewed remotely and data logs can be downloaded and shared with the free Kestrel LiNK app (approximately 100' range). Pricing for the 5500FW Fire Weather Pro starts at \$355 to \$422 with LiNK.

- The Kestrel 5400FW Fire Weather Pro WBGT with LiNK, Compass and Vane Mount is the all-in-one fire weather and heat safety meter. This unit sells for \$609 and includes all the capabilities of the 5500FW with the addition of WBGT monitoring and user settable visual and audio alerts to warn when conditions are not safe. WBGT is the most accurate model for predicting human heat stress and adds critical insight into preventing heat injury during conditioning training and while working on a fire line.

### Conclusion

Basic weather conditions are crucial information for firefighters. These conditions lead to predictions in flame length, rate of spread, probability of ignition and fuel moisture. Accurate readings lead to more accurate

predictions and readings that are available quickly and in multiple locations due to LiNK wireless connectivity mean that firefighters on and off the fire can use the data to quickly and safely preserve lives, property and resources.

➔ For more information, go to [www.kestrelfireweather.com](http://www.kestrelfireweather.com)

### References

- \* Technical Report ECOM-5399 - FIELD COMPARISON BETWEEN SLING PSYCHROMETER AND METEOROLOGICAL MEASURING SET AN/ TMQ-22  
By Ronald W. Waite. Atmospheric Sciences Laboratory White Sands Missile Range, New Mexico; August 1971. Pg 29  
" 3. If care is taken in making measurements with the sling psychrometer, the relative humidity error can be accurate to +/- 4% RH;  
4. From reviewing the data taken by all operator personnel it appears that the sling psychrometer readings will be in error by at least +9% Relative Humidity."  
Comparison of Sling Psychrometer to Digital Weather Meters, Chuck McKugh & Lary Bradshaw Fire, Fuels, Smoke Program RMRS, Fire Sciences Lab Missoula, Montana  
<https://videos.firelab.org/ffs/2014-15Seminar/042315seminar/042315seminar.mpg>  
\*\* Death in the Line of Duty...A summary of a NIOSH fire fighter fatality investigation <http://www.cdc.gov/niosh/fire/reports/face201117.html>



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A photograph of two firefighters in full protective gear, including helmets and oxygen tanks, fighting a large fire. They are holding a hose and spraying water onto the flames. The background is filled with intense orange and yellow fire and thick black smoke. The scene is industrial, with metal structures and pipes visible.

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